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Convention Arrangements

NO decision has yet been announced by the British Electrical Development Association regarding the question of a National Convention to be held next year. Perhaps an organisation made up of so many parts does not find it easy to make up its many minds.

Other bodies, however, have fixed places and dates, though we suppose they are still open to revision, for gatherings in May and June. Perhaps in course of time we shall know more of E.D.A.'s conclusions, enabling us to form some idea of what 1933 will bring forth in the way of public celebration of the new stage reached in the development of Britain's electricity supply.

Pending a settlement of the national question, the arrangements unanimously adopted by the Executive Council of the Incorporated Municipal Electrical Association may be considered. Plans are announced for holding its annual convention at Bournemouth from June 12th to 18th, the former full-week programme being reverted to with an electrical exhibition as an important part of the proceedings. All of the meetings will be held in the Pavilion, while the exhibition will take place in the Winter Gardens.

The subjects so far chosen for the papers and discussions are: domestic and commercial electric cooking, tariffs and metering, and the cost and construction of sub-stations. One subject at least remains to be chosen, and in our opinion the meeting will not be complete unless a prominent place is given to the need for all undertakings to adopt truly go-ahead methods and efforts for speeding up the use of electricity by everybody. But perhaps many more will have put their house in order by that time. There must be no shirking this matter. The industrial load also should receive attention, for municipal obligations are not restricted to any particular class of supply.

The present forecast is that the exhibition will be on a larger scale than usual, for "it is hoped that the exhibits will include *all* modern domestic apparatus and lighting equipment." A complete collection of these products alone can be made to form a magnificent popular display as well as an occasion for serious instruction and edification of the purely electricity supply mind. But why limit it to these lines at so popular a resort, when small industrial power, radio and other general electrical features, would make a complete demonstration to the whole country at a very favourable moment?

Bournemouth, as everybody knows, presents almost unparalleled electrical illumination opportunities at any time. The place is large enough to accommodate many more delegates than usual, so that the interest of the organised power and London and provincial electricity supply companies could be invited, thus ensuring a simultaneous gathering of all electricity supply organisations, whatever their ownership. In this way we could demonstrate appropriate unity of effort in an eventful year, and the contractors and the I.E.E., if they preferred, could plough their own furrows in 1933 and take another year to think matters over.

Lighting and Aerial Navigation

THE scope of long-distance night flying in the Old World has hitherto been limited by the diverse methods of lighting adopted by the different nations whose frontiers are crossed for indicating airways and aerodromes. In the United States, we believe, a greater air mileage is covered by night for the carriage of mails than by day, with great saving of time. In 1929 the British Aviation Committee was set up by the British Standards Institution. This committee, on which the Air Ministry, the National Physical Laboratory, and commercial aviation interests are represented, has worked under the auspices of the International Communication on Illumination. Its recommendations were adopted by the delegates of ten nations at Zurich recently, and await ratification by their national committees. We expect to hear shortly that the obstacles to night flying have been removed. Immediate lighting standardisation is required for

marking aerodromes, defining safe landing areas, indicating wind direction and strength, and outlining obstructions. Among the more technical aspects are intensity of illumination and the colour of the light. For meeting bad-weather conditions the wavelength of the light is important, and we anticipate that the high value of the effective flux emitted by neon lamps will cause them to be favoured for many purposes.

Courage the Motive Power

IF only the floodgates of enterprise could be opened what a boon it would be! By putting the brake on legitimate work-producing, revenue-earning expenditure stagnation becomes synonymous with creeping paralysis. On a later page of this issue Mr. M. J. Railing, who is the present chairman of the B.E.A.M.A. Council, appeals for the all-round display of courage, which he rightly describes as "a motive power of industry." He justifiably writes hopefully regarding the electrical industry as an exceptionally promising field for development, and urges the Government, our leading authorities, those who control industry, and the private citizen as well, to remember that by closing the door to new enterprise we shall only aggravate the existing bad conditions.

Sodium Lamps

MR. F. N. RENDELL-BAKER is to be congratulated upon his enterprise in installing sodium gas-discharge lamps to light a stretch of arterial road in Croydon. Regarded from a utilitarian point of view, they serve their purpose very well; even and adequate illumination, freedom from glare, and the avoidance of the need for car head lamps certainly make for safety, which the Mayor of Croydon declared to be the main object of road lighting. How far light of an almost monochromatic character would be acceptable in urban streets may be questioned; the effect is not cheerful, and people do not look at their best, but we suspect that the somewhat dull appearance of the light may be due to the vitiation of our senses by glare. The colours of motor cars can be broadly ascertained, but it is not so easy to distinguish by colour only a pound note from a ten shilling note. For the illumination of arterial roads, the gas-discharge lamp, even as it is, should have a wide field of its own. It should hasten the day when standards of illumination for different classes of thoroughfare will be laid down by a central authority in the interests of public safety.

A Push All Together

WHENEVER the need for more aggressive electricity supply action comes under discussion in our pages there follows a suggestion from some quarter or other for united organised effort. Sometimes it has been a commercial electrical association that has been asked for—a want that has not yet been satisfied. To-day, on another page, Mr. R. D. Reynolds, consumers' engineer to the West Gloucestershire Power Company, advocates a national movement to recruit all persons engaged in the electrical industry as a great propaganda force. He suggests, too, that, in view of the insidious working of gas publicity efforts, everybody getting a living out of electricity ought to provide himself or herself with all the available powder and shot necessary for destroying the false statements and arguments which are constantly being used to decry electricity. We have no objection to attack or criticism from gas interests when naked and unashamed, but we suspect that gas propaganda travels by very circuitous routes even to our own post-bag occasionally. The gas people are active because they know they have got to be so if the electrical industry is going to back up its superior commodity with a real live business policy. Let us give the devil his due, but let us believe in electricity and say so!

"Choking-off" Consumers

IT is very necessary to deprecate the policy of some supply authorities of discouraging the cooking load because their old distribution networks were not designed to deal with modern residential loads. It is a little late in the day—in 1932—to offer this excuse for holding up progress. The cooking load is not a new thing. For years its potentialities have been discussed, everywhere and at all seasons, and for years many undertakings have been turning these potentialities into actualities at an accelerating rate with satisfactory results. This should be known to all, and yet there are undertakings that have inevitably come up against voltage-drop difficulties because their mains-laying programmes have temporarily lagged behind the demand by their consumers for the heavier domestic apparatus owing to the progressive policy adopted. The continued advance of such undertakings leads us to believe that the dissatisfaction due to poor voltage regulation is nothing like that due to a policy of "choking-off" caused by undertakings not having kept abreast of modern developments.

Remote Control

THE new signalling installation on the Stanmore extension of the Metropolitan Railway is probably of interest to electrical engineers apart from its significance in railway signalling, in that it shows that the complex problem of controlling and indicating the operation of functions at a considerable distance over three wires has been accomplished with ease and safety. It seems that in many respects the problems which have had to be met by the railway engineers and the manufacturers of the equipment have some similarity to those facing engineers dealing with the remote control and indication of switchgear operation in electricity supply work. There is in this matter yet another obvious case for co-operation.

An Engineer's Liabilities

FEW of us who have served in supply undertakings can have escaped the sickness of heart that has followed a momentary lapse of attention which has endangered a colleague. Some, indeed, cannot forget that the consequences were fatal. But, apart from the remorse that is felt, a liability for pecuniary damages is incurred by the responsible engineer. That is the conclusion we draw from the report of the action taken by the Darlington Corporation against one of its charge engineers. The defendant was represented by Mr. J. W. Thomas, of the Electrical Power Engineer's Association, and, although the action, in this case, was *pro forma* (the Corporation paying the fine imposed), the liability to incur penalties, of uncertain amount, provides additional justification for the existence of a protective organisation.

The Grid Tariff

THE communication from Mr. W. Fennell in our correspondence columns to-day appears to deprecate criticism of the grid tariff. But criticism, if really constructive, may be helpful, and even if it prove to have been ill-considered it serves a purpose in revealing its weakness. If any appreciable body of supply authorities feels that its interests have been insufficiently regarded it will, no doubt, be well advised to approach the C.E.B. The broad principle of the grid tariff, *e.g.*, to encourage development, is fully able to meet criticism. The merit of public discussion is that it demonstrates whether those taking part are sincerely considering the wider aspects of electrical progress. These alone can be allowed to carry weight.

The Lion and the Lamb

AT the recent annual meeting in Berlin of the German Vereinigung der Elektrizitätswerke the president described the campaigns carried on by members of the Union and by the concerns associated with the German Association of Gas and Water Engineers in favour of their respective media—electricity and gas—as unworthy of both industries, and he made a "peace offer" to the gas industry that the campaigns might in future be carried on in a way less harmful to both. We hope that our German friends will still consider electricity better than gas, even if they refrain from saying so.

Modern Electric Passenger Transport

1. The L.C.C. experimental car "No. 1." 2. The latest L.C.C. service tramcar—class HR/2. 3. One of the new trolley buses of the London United Tramways, Ltd. 4. A recent addition to the L.U.T. system. 5. A six-unit train in service on the Brighton line of the Southern Railway. 6. One of the new Piccadilly line trains ("Underground"). 7. Another Southern Electric train. 8. An Armstrong-Whitworth 250-b.h.p. oil-electric train.

Courage—A Motive Power for Industry. By M. J. Railing

A call for a more venturesome spirit

ALL students of history are familiar with a phrase that has passed as a metaphor into our language—"the swing of the pendulum." It is exemplified in matters ranging from the rise and fall of nations to the fluctuations in the fortunes of a single country; but it is particularly appropriate to the changes which take place in industry. The outlook for trade and industry periodically undergoes many variations as the economic situation alters; but though, during the last thirty or forty years, we have seen alternations of prosperity and depression in our own country, the economic crisis which remained as an after-effect of the war is more serious and of greater importance than any that we have known for centuries past, and it affects not only a few countries but the whole civilised world.

The direct results of this crisis have brought stagnation to many home industries, and have particularly injured our export trade; and, as a consequence, a lack of confidence in the future has been engendered. Under this shadow many enterprises which in less disturbed conditions would have been started with every prospect of success, are to-day either abandoned or indefinitely postponed; thus we arrive at a vicious circle, since, by this anything but courageous policy, work is withheld from thousands who might otherwise be happily employed, and trade becomes still more depressed.

The electrical industry at home has not been affected to any disastrous extent, although in other countries it has been seriously hampered by the world-wide *bouleversement*. We have been fortunate in seeing the introduction of the grid schemes, which for the last few years have provided a considerable outlet for the heavy engineering side of the industry; also, since we have not developed so rapidly in electricity supply as some countries have done—especially along the lines of low-pressure distribution—we have naturally felt the benefit of increasing public demand during the years of stress.

[*Int. Rotogravure*

Mr. M. J. Railing is joint managing director of the G.E.C.

Rifts in the Clouds

Many of the steps that have been taken during, let us say, the last twelve months, are gratifying to one who looks ahead, inasmuch as they benefit the community, tend towards sanity of thought, and show appreciation of the fact that the first condition of true progress and of sound judgment must be an intimate understanding of economic conditions, a comprehension of the vital importance of healthy and remunerative investment.

To take one point: the realisation that our home industries must be protected against the dumping of commodities manufactured by foreign labour at lower rates of pay should bring increased activity in the manufactures of this country, resulting in a greater and beneficial flow of money and capital throughout the Empire. Though, as yet, this and other sensible decisions may not have shown impressive results, their effects are beginning to be felt, and the time has arrived when fresh confidence in the improved industrial conditions of the Empire is not far away. Obviously, without stronger confidence in the general international situation, a thorough revival of trade cannot be expected; yet the renewal of a more favourable outlook at home is giving a basis for improvement, slight though it may be. We are setting our own house in order, and if only our tentative improvement can be established, the example thus set may well lead to a more rapid solution of the present world-problems. If we can get out of the rut why not others?

Dangerous Public Economy

The idea was drilled into us all last year, under the shock of realisation that our national burdens were almost too heavy, that practically every form of expenditure must cease, whether State, municipal or private, unless it was dictated by absolute necessity. This theory has entered into the minds of the public so deeply that, apart from causing the slowing down of actual existing business, it has stopped almost every expenditure of capital on new enterprise. Uncertainty has shadowed every desire to expand, to launch out, in the old healthy British way; shipbuilding is restricted to the absolute minimum, railway electrification schemes are shelved, the mining industry is hampered, and our steel works and rolling mills suffer for lack of new equipment. Nobody has had the courage to suggest that the present stagnation of trade is in itself an opportunity to use our accumulated knowledge and experience for the benefit of all—by modernisation of methods in manufacture and industry, by adopting fresh inventions, by a thorough overhaul to discover exactly where improvements can be made.

Ample Funds Available

This state of indifference or blindness—call it what you will—is deplorable indeed. With the cheap money offered by our financiers, and the savings of the public lying idle on deposit, money is inert, instead of being, as it should be, a live force, used to promote enterprise, and to ease, not by useless gifts, but by work, the unemployment which is causing so much misery to-day. The need for rigid economy, urgent not so long ago, is not now so pressing, and wise expenditure is a far better policy. With a little more courage in our outlook at home, giving an impetus to fresh enterprise, we might bring to birth very quickly a feeling of greater confidence all over the world. Surely the British Empire is a vast enough ground for cultivation!

From every point of view this more courageous attitude is desirable. From the point of view of any industry—since those concerned in a weakening field of work either leave it or deteriorate; and, obviously, from the point of view of those who have invested money in faith that it will be rightly used.

The electrical industry, with its astonishing developments during the last ten years, presents an exceptionally promising field in this direction. It seems to be unlimited; hardly a month passes without some new byway of electrical application being discovered and utilised. Advances are recorded in standards and methods of illumination; in electrical propulsion of ships; in the use of electricity for industrial heating, welding, metallurgical furnaces; and in dozens of other branches of industry. Nor must we forget the domestic side. The coming of the grid into full operation means that in due time—these things are not done in a moment—new areas of the countryside will be opened up; many old houses will be modernised electrically; the farmer's wife and the villager in isolated districts will have at command the many benefits which electricity has brought to the housewife of the town. All these things, properly undertaken and wisely organised, would mean the provision of work for many thousands; work which would not only improve housing and living conditions, but, if used in the modernisation of some of our trades on the lines previously mentioned, would strengthen us to face competition and give immensely enhanced assurance for the future.

To-day is the time to take courage, to tackle these urgent problems. Raw materials are cheap, and capital outlay can be effected upon a particularly favourable basis. Such developments would carry our population over this period of stagnation, would prevent the deterioration of trained and skilled artisans (in itself a disaster to any industry); and last, but not least, it would undoubtedly be the first great step towards recovery.

Away with Pessimism

The time has come when not only the Government, but our leading authorities, those who control industry in general, and even the private citizen, should realise that by doing nothing, by simply closing the door to every new enterprise, the existing bad conditions are aggravated instead of being courageously challenged. There is no more fatal hindrance to progress than pessimism; and there is no greater stimulus in times of difficulty than courage founded upon experience. Not the blind recklessness which rushes into danger without counting the cost; but real courage, which takes into consideration possible obstacles and risks, and confronts them armed with knowledge. This courage, strengthened by confidence in the stability of British industry, is, I would most definitely emphasise, the inspiration we need to-day as a motive power for the rehabilitation of the world's industry.

A Street Lighting Conference

Under the auspices of the Northern Counties Area E.D.A. Committee a conference on street lighting took place at Sopwith's Lounge, Northumberland Street, Newcastle, on December 1st, when Mr. W. J. Jones (E.L.M.A.) read a paper on "Street Lighting" and Mr. E. C. Lennox, North-Eastern Electric Supply Co., presided. The audience, numbering over 100, was representative of many street lighting committees in the area.

Some Municipal Electrical Engineers

From left to right: Mr. J. H. Shepherd, Harwich; Mr. P. E. Rycroft (*Elliott & Fry*), Great Yarmouth; Mr. S. R. Windle (*Sherlock*), Grimsby; and Mr. A. J. Waring, Felixstowe.

Power Stations in Parallel. By W. B. Norton

SINCE the advent of the grid the parallel operation of power stations has become of great importance in this country. The fundamental principles involved may be summarised as follows: governor settings of alternator prime movers; loading of interconnector; function of interconnector; design of interconnector; and satisfactory commercial arrangements combined with economical operation of power stations.

When two power stations are linked together by an interconnector, the only way in which either station may increase or decrease its share of the total load is by altering its steam supply. The effect of increasing the excitation of all the alternators in one station causes the alternators in that particular station to give an increased reactive magnetising kVA, and they will then operate at a lower power factor. The manner in which the total load is proportioned between stations depends upon the characteristics of the steam governors, and this can be easily calculated.

Station governing must be considered with respect to plant kVA and loading conditions of stations and interconnectors. Assuming that two stations, A and B, of 50,000 and 20,000 kVA capacities, respectively, supply a system upon which an extra load of 4,000 kVA is thrown, if both stations have the same no-load speed and speed drops of 2 per cent. and 3 per cent. between no load and full load, respectively, the proportions in which each station will share the extra load are $a/b = 50{,}000/20{,}000 \times 3/2$ and $a+b=4{,}000$, when a and b represent the proportions of increased load: whence $a=3{,}160$ kVA and $b=840$ kVA.

Thus a large station having fine governing, operating in parallel with a small station having comparatively coarse governing, will take the bulk of any load variations. If the interconnector has only a small kVA capacity and B's load is subject to fluctuations it may be impossible to keep the interconnector load within permissible limits, in which case the governor settings of one or both stations may have to be altered.

The Maintenance of Synchronism

The functions of an interconnector are to convey power from one station to another and to maintain both stations in synchronism during load fluctuations. The greatest de-synchronising forces are those due to large and rapid fluctuations. Assume two stations A and B to be interconnected, power being conveyed from A to B. If a sudden increase in load is demanded from B, then the alternators in B will momentarily tend to slow up in speed, thus increasing the amount of power conveyed by the interconnector to B's busbars. This increase is known as the synchronising power, and must be sufficient to arrest the decrease in speed of B's alternators, thus maintaining the two stations in synchronism. With a large station the synchronising power must be sufficient to arrest the low velocity swing of a mass having a large moment of inertia, and with a small station a comparatively high velocity swing of a mass having a small moment of inertia.

So long as the station busbar voltages remain constant, the amount of power flowing along an interconnector will depend upon its resistance and reactance and the stable phase-angle displacement between the two station voltages. The synchronising power of any interconnector is the extra power conveyed when the stable phase angle between the station voltages is displaced. The stable voltage phase angle is defined as the necessary phase displacement between the station voltages in order that power may be conveyed from one station to the other for network supply only.

Design of Interconnector

Let Ea and Eb be the voltages of stations A and B operating in parallel, and V be the potential difference between them, *i.e.*, the potential difference between the two ends of the interconnector when a current flows along it. Then when Ea and Eb are in phase and equal, the power in the interconnector is zero. This condition is shown in Fig. 1. Thus no power is conveyed between the stations. But if an additional load is thrown upon B then B's alternators momentarily tend to slow down, thus increasing the angle a, and the resultant of

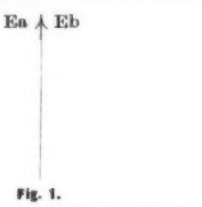


Fig. 1.

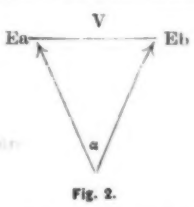


Fig. 2.

the two voltages is now V. This condition is shown in Fig. 2. If the interconnector reactance is zero then the current flowing along the interconnector will be in phase with V. Since, in practice, the angle a is very small, the interconnector current can be assumed to be in quadrature with Ea and Eb, which are the station voltages, so that when the interconnector reactance is zero the synchronising power is also zero.

When the resistance and reactance of the interconnector are equal the power, and also the synchronising power conveyed from one station to another, is at the maximum. This is of great importance, since while the resistance of the interconnector is usually fixed by economical considerations, the reactance can be designed to give the best results for very little cost.

Certain conditions of parallel operation may be technically satisfactory but commercially unsatisfactory. When several power stations are interconnected under different price agreements an increased cost per kWh would be charged if a supply was required from any station during the times that the particular station was operating at full output. Thus steaming conditions must be considered in relation to price agreements.

Progress in Radio Research

The Department of Scientific and Industrial Research has issued the report of its Radio Research Board for the year 1931 (H.M. Stationery Office, price 2s. net) summarising work carried out during the year in connection with the fundamental study of the electrical state of the upper atmosphere and its influence on the propagation of wireless waves of all frequencies; the principles and improvements of method of radio direction-finding; the study of atmospherics from the standpoint of radio communications and meteorology; the development of radio-frequency standards, and the improvement of electrical measurements at high frequencies.

Voltage Control. By E. T. Norris, M.I.E.E., Fellow A.I.E.E.

A new means of regulating the pressure in a.c. systems

A "MOVING-COIL" regulator has recently been evolved for the control of a.c. voltages. The essential features of this are shown in fig. 1*a*. They comprise a two-legged laminated core as used in transformer construction with coils *a* and *b* mounted respectively at the top and bottom of one leg, and a short-circuited coil *s*, which is free to move up and down the leg between coils *a* and *b*. The coil *s* is entirely isolated electrically, so that no flexible connections, slip rings, or sliding contacts are required. If a voltage be applied to coil

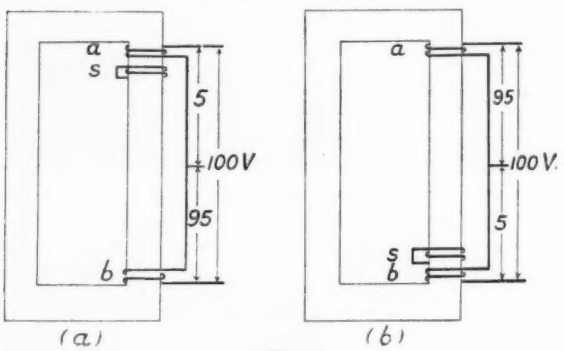


Fig. 1

a only, the resulting current will depend upon the impedance of this coil, which is determined by the position of *s*. This coil may be looked upon as a gate preventing the passage of magnetic flux through it.

The closer the moving coil is to coil *a*, the greater its short-circuiting effect, and, therefore, the lower the effective impedance of *a*. Hence, with the moving coil in the position shown in fig. 1*a*, the impedance of *a* will be small, and that of *b* large. If a voltage be applied across these two coils connected in series, then the greater part of the voltage will appear across *b*, and a small part only across *a*. With the moving coil at the bottom of the leg, as in fig. 1*b*, the respective impedances of coils *a* and *b* are reversed, and the greater voltage will now appear across *a*.

With the values assumed in the figures, and an impedance variation of 20/1, the pressure across coil *b* can be varied smoothly and uniformly from 5 to 95 V by varying the position of the moving coil.

Alternative Designs

Only in testing transformers and the like is such a wide range of voltage variation required. In transmission and distribution circuits, a range of from 10 to 20 per cent. is sufficient. These variations can be obtained either by using the regulator in conjunction with a tapped transformer, as in fig. 2, or by means of additional windings on the regulator, as in figs. 3 to 5. In fig. 2*a* and *b*, the regulator is connected across a portion of the winding of the transformer. By a suitable choice of transformer tappings, any desired range of voltage variation can be obtained.

The second method is of more general application, in that the regulator is entirely independent of any transformer or other apparatus. In effect, the voltage variation obtained in fig. 1 is stepped down to the desired value by means of an additional coil or coils connected in series with the line. An arrangement giving voltage boost only is shown in fig. 3, and diagrammatically in fig. 4. The voltage across the boosting coil *r* will be a constant fraction of the voltage across the adjacent coil *a*, depending upon the turn ratio of these two coils.

In figs. 4*a* and 4*b* it is assumed that coil *a* has ten times the turn of coil *r*, and the output voltage varies from 100.5 in the minimum voltage position to 109.5 in the maximum voltage position. By reversing *r* its voltage would be subtracted from the input voltage, and the secondary pressure would then vary from 99.5 to 90.5 V.

If both buck and boost are desired, a coil similar to *r* is mounted at the bottom of the leg close to *b*. Assuming that this bucking coil *l* has one-tenth of the turns of *b*, then with the moving coil in the minimum voltage position, as in fig. 5*a*, the output pressure will be 100+0.5−9.5=91 V. Similarly, with the moving coil in the maximum voltage position, as in fig. 5*b*, the output voltage will be 109, the total variation being ±9 per cent. of the input voltage. By choosing suitable turn ratios for coils *r* and *l*, any desired values of buck or boost can be obtained.

Constructional Features

The moving-coil regulator is built, in general, on the same lines as ordinary static transformers. The regulator can, therefore, be designed for high voltages and heavy currents without shunt and series transformers. The coils are wound in sections, and are of the disc or cross-over type, depending upon the current and voltage. Coil supports, spacers and oil-cooling ducts are provided where necessary, both mechanical and thermal design again being the same as for ordinary transformers. Very small sizes for indoor operation may be air insulated and air cooled, but all others are oil immersed in plain, tubular, or radiator tanks, depending upon the size.

Single-phase regulators are of the divided core type, that is, having three legs, the centre leg only being wound. In the smaller sizes, the moving coil is carried in a non-magnetic

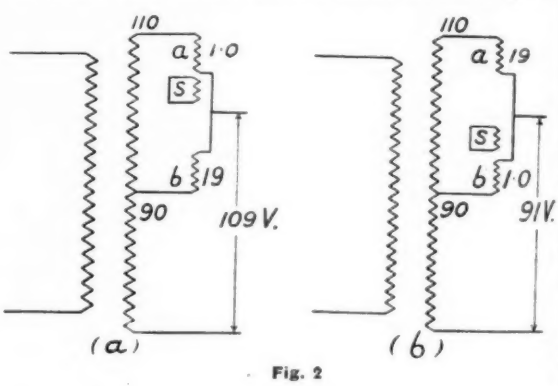


Fig. 2

frame operated by a square threaded shaft. For automatic operation the mechanical drive is by induction-disc ball-bearing motor, through a single-bevel or worm gear. In the larger sizes, the moving coil is supported at both ends and operated by two square-threaded vertical shafts; mechanical drive is by induction-disc motor through skew and worm gears, except in the largest sizes where ordinary three-phase induction motors are used.

Three-phase regulators are of the rectangular-core type with three wound legs. The moving coils of each phase are held in a common framework operated by square threaded vertical shafts at either end of the core. The induction-disc motor is

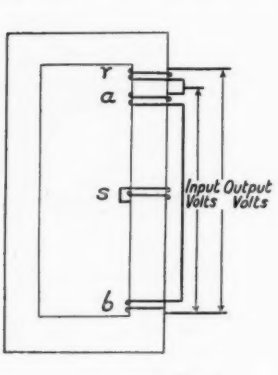


Fig. 3

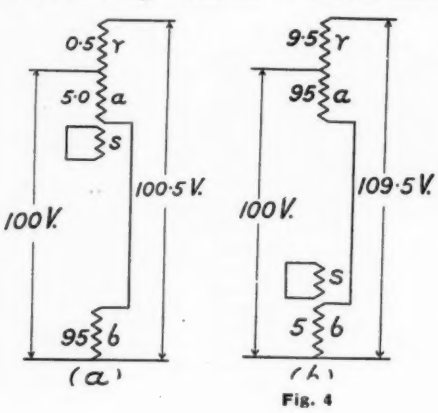


Fig. 4

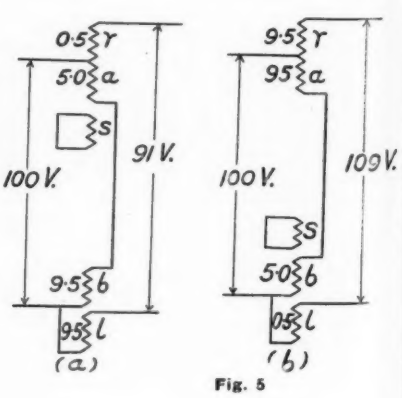


Fig. 5

mounted on top of the core driving a horizontal shaft which operates the square-threaded vertical shaft through worm or bevel gear. In the very largest sizes an externally mounted three-phase induction motor is employed.

In all types of regulator, except the largest sizes, all the mechanical operating gear, including the motor, is oil immersed, and ball bearings are used throughout. The regulator complete with its mechanical gear as a unit, is contained in a tank of standard transformer construction. All sizes of regulator can be designed for outdoor operation, and provided with cable boxes or hangers for pole mounting.

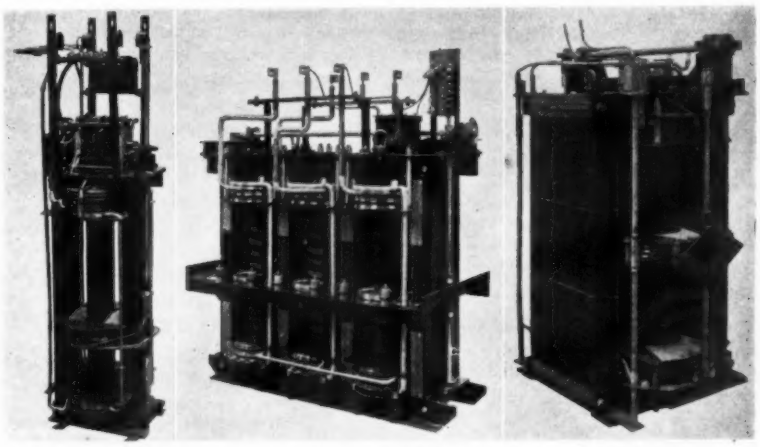
There are no continuously moving or fast-running parts, and no oiling or greasing is required; the only part of the apparatus which needs inspection, or maintenance, is installed in this control box, and the regulator tank need not be opened in the normal course of operation and maintenance.

Technical Characteristics

In general the moving-coil regulator has the same characteristics as an ordinary transformer. Some of these vary with the voltage, but for a given regulator position the performance can be expressed in standard transformer terms and the same vector diagram will apply.

The iron losses are in general low, as the core iron is run at a very low flux density, and the greater part of the magnetic reluctance is due to air. In order to reduce the current in the short-circuited windings, coils *a* and *b* are connected in opposition so that the currents they induce in the moving coil tend to neutralise. This connection has no other effect on the operation of the regulator, but as a result there is no current in the short-circuited coil at no-load for any position of the regulator. On load, the current is proportional to the load current and still independent of the regulator position. Both load and no-load losses will vary with the current and flux densities and weights of iron and copper. The losses can, therefore, be varied with cost exactly as in an ordinary transformer.

The no-load current is practically constant for all positions of the regulator for a given primary voltage. Apart from being less, it differs only in one important respect from the corresponding transformer no-load current, in that, due to the low flux density and the large proportion of air path in the magnetic circuit, the magnetising current is practically sinusoidal.



Three examples of moving-coil voltage regulators: (Left) a 5-kVA automatic single-phase regulator; (centre) a large three-phase regulator; (right) a single-phase regulator for 300 kVA, 6.6 kV

The moving coil is operated on by forces in opposing directions from the fixed coils *a* and *b* at either end of the leg. These forces, therefore, tend to press the fixed coils against the framework and coil supports attached to the yokes. The mechanical structure is here exactly the same as in ordinary static transformers. The resultant force on the moving coil itself is extremely small, due to this neutralisation, and is zero at no-load for any position of the regulator. The worst forces occur when the moving coil is at the bottom of the leg and act in opposition to the weight of the moving coil due to gravity. In standard regulators the maximum force on the moving coil in the worst position at full load is actually less than the weight of the coil itself. These forces being slight, the power required to operate the moving-coil regulator is very small. For all except the largest regulators a motor of the induction disc type is sufficiently powerful.

Under short-circuit conditions the forces on the moving coil do not, owing to saturation of the iron, increase as the square of the load current. The short-circuit forces are, therefore, much lower in relation to the forces at normal load than in ordinary transformers. Moreover, the coils, being of simple shape, are easy to hold mechanically, and can be securely braced and clamped to resist mechanical stresses.

The following tests were made on a standard moving coil regulator, selected at random, to determine its ability to withstand the mechanical and electrical stresses caused by the severest sudden short-circuits. A regulator, rated at 5 kVA and giving ±10 per cent. voltage variation in a 460/230-V circuit, was connected on the primary side through a large step-down transformer to 6,600-V mains. The power available was such that the short-circuit caused negligible voltage drop and full primary pressure was maintained on the regulator under short-circuit conditions. The output side of the regulator was short-circuited through a low variable resistance.

Nine tests were made with the regulator moving coil in different positions. Short-circuit currents ranging from 10 to 19.5 times the normal full-load value, were obtained. An oscillogram record was taken with the regulator in the full-boost position, in which the maximum short-circuit current was fifteen times the normal value. The short-circuits had no effect on the operation of the regulator, and subsequent examination showed no signs of damage.

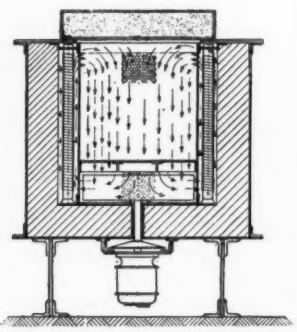
The whole of the forged boiler drums for the six Stirling boilers to be installed in the new Fulham power station are to be made at the Vickers works of the English Steel Corporation, Ltd., Sheffield. The largest of these drums will be about 40 ft. long and 5 ft. 3 in. outside diameter. The ingot required (right-hand picture) weighing 175 tons is claimed by the Corporation to be the largest ever produced in this country. The drums will be made in one piece, including the closed ends, which are formed from the tubular forgings by a special process developed by the Corporation. The left-hand picture shows some drums of this type supplied for the T.S.S. ***Conte di Savoia.***

Low-temperature Metal Treatment. By A. J. T. Eyles

The scope for the modern electric furnace

ONE of the outstanding accomplishments in heat-treatment last year was the material lowering of nitriding costs in the surface hardening of steel. The temperature of nitriding varies from 480 to 580 deg. C., depending upon the particular plant and the character of the nitrided product; usually it falls between 510 and 540 deg. C.

A few years ago, the only low-temperature treatments were those for tempering certain steels and for annealing some non-ferrous alloys, the temperatures ranging from 200 deg. to 450 deg. C., according to the nature of the work and its purpose. The secondary hardening of high-speed steels at 600 deg. C., which has been practised for many years, is on the increase owing to the greater use of these steels. The heat-treatment of nickel and nickel-chrome steels, and of aluminium alloys, and the annealing of aluminium and aluminium alloy billets for forging now provide a great field for the low-temperature furnace.



Air circulation in a Wild-Barfield furnace

Experience proves that temperature control and uniformity are more important in low-temperature than in high-temperature work. In some treatments a fluctuation or variation of a few degrees either way is sufficient to spoil a whole batch of work in the furnace. Hence, it is natural to look to modern electric furnaces for such heat-treatments.

Means of Controlling Temperature

A cross section of the new Wild-Barfield electric furnace is reproduced; this is fitted with a centrifugal fan to assist the natural convection currents. In operation the air is drawn down the centre where the work is situated, and is then thrown outwards at the bottom to return to the top by way of heaters fitted at the sides. The speed of rotation causes the maximum quantity of air to be circulated in the most effective manner so that the temperature variation over the whole furnace is not more than 3 deg. C., and the rate of heating the charge is increased. It has been calculated that the rate of heating a charge in a furnace fitted with a centrifugal fan is no less than thirteen times that obtained without the fan, up to 100 deg. C., and four and a half times as rapid to 250 deg. C.

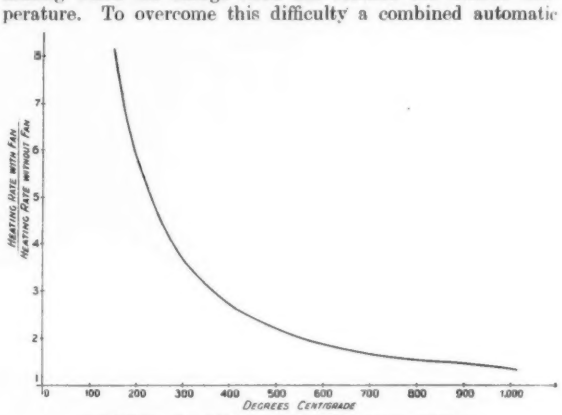
The increase in heating rate falls off as the temperature increases, and at 600 deg. C., the time required to reach the temperature with a centrifugal fan running at the same speed is slightly more than one-half that required without a fan. One of the largest British spring manufacturers having a tempering furnace with an ordinary propeller fan recently installed one with the special centrifugal fan. A comparison of the rates of heating, uniformity of temperature and product, and output was so much in favour of the latter method that further units were added of the same type. The operating costs are kept low, owing to the efficiency of the fan in heating the charge rapidly and to the adequate insulation.

The temperatures required for forging and stamping aluminium alloys are below the visible red and the dangers due to overheating cannot be too strongly stressed.

The two seven-ton aluminium furnaces illustrated are two of the largest electric heat-treatment furnaces installed in Great Britain. Two centrifugal fans are fitted in each chamber, which is 14 ft. long by 7 ft. wide by 5 ft. high to the spring of the arched roof, and has an electric loading of 204 kW. The side and roof elements are connected up at the back of the furnace to suit the 400-V three-phase 50-cycle system, the sides being on one phase and the roof on another, whilst the floor elements, to obviate risk of leakage of current through the charge, are connected to suit a lower voltage obtained by means of single-phase, oil-cooled, double-wound Ferranti transformers wired to the third phase.

Charge Progress Recording

There is one feature common to both electric and gas-heated low-temperature furnaces, *viz.*, the difficulty of determining when the charge itself has reached the desired temperature. To overcome this difficulty a combined automatic temperature controller and charge progress recorder has recently been developed by Wild-Barfield Electric Furnaces, Ltd., to work in conjunction with electric furnaces with forced air circulation.

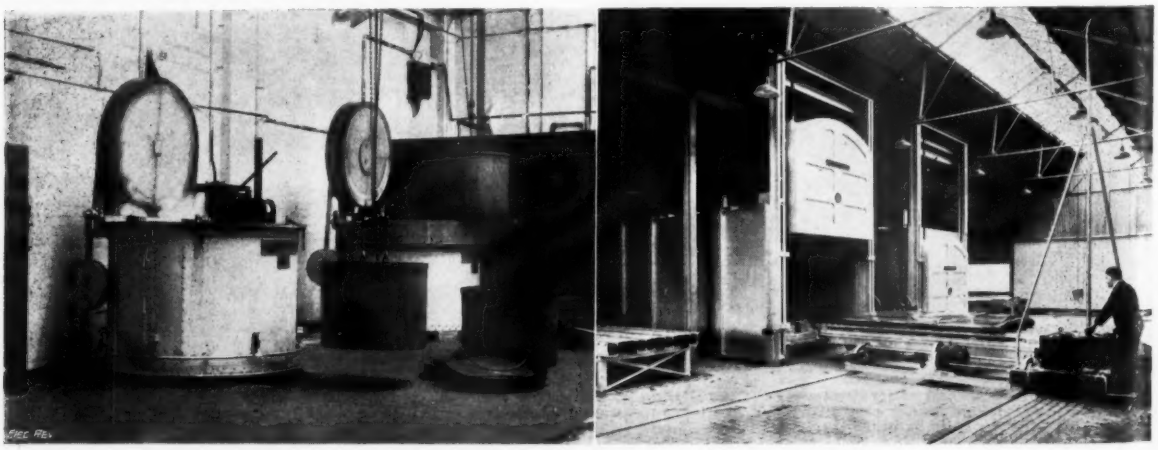


Variation of heating rate with temperature

The charge progress recorder is of the standard type with additional apparatus by which two records are obtained on the one chart. One record, in red, represents the furnace temperature; the other record, in black, shows the progress of the charge.

In the early stages of the heat-treatment there is a wide divergence between the two records, but as the heating proceeds the charge record approaches the furnace record, and ultimately, when the entire charge is heated to the desired temperature, the two are coincident. Thus a definite indication is given of the state of the charge, enabling the operator to know when to withdraw the work, or commence the soaking period in the case of aluminium alloys.

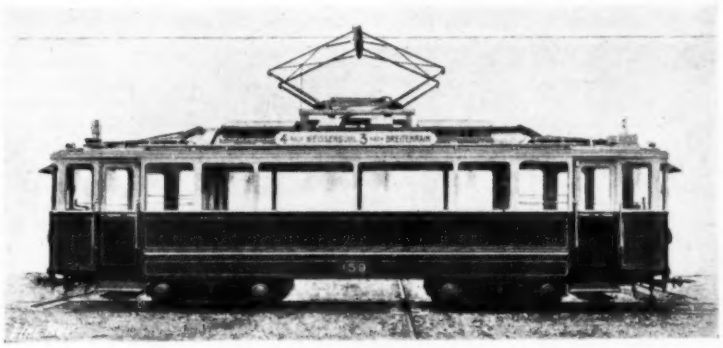
Time is saved and irregularities in the records show if the furnace is not kept in constant production; also, a permanent record is available of the heat-treatment given to every batch of work.



Left: Furnaces fitted with centrifugal fans in the tempering shop of a large spring manufacturer. Right: Two large heat-treatment furnaces for aluminium sheets

A New Swiss Electric Tramcar

A NUMBER of electric tramcars of a new design have lately been put in service by the municipality of Berne, Switzerland. They are of the single-deck type with seating accommodation for twenty-four passengers and standing room for thirty-six more on the two end covered platforms and in the central gangway. A feature of the vehicles, the mechanical part of which was built by the Swiss Industrial Co. of Neuhausen and the electrical equipment by the Oerlikon Maschinenfabrik, is that the two ends had to be considerably narrowed to ensure the necessary clearances owing to the sharp curves on the tramway track and the great length of their bodies.



The new Berne car

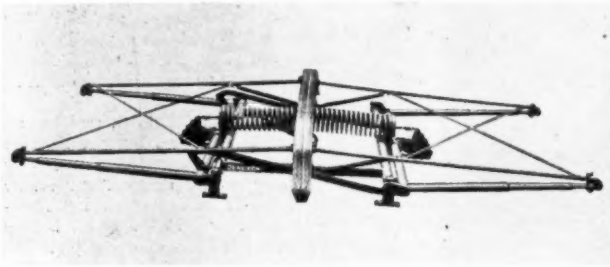
The sole bars form part of the sides of the car, and as a result the moment of inertia is sufficient to render trussing superfluous, and to remove the possibility of the sinking of platforms due to the large overhang. The diameter of the wheels (24¾ in.) is relatively small for cars with nose-suspension motors and with simple reduction gear.

The electrical equipment of each car comprises four self-ventilating 550-V motors, giving a continuous output at the driving wheel of 31.5 h.p., the gearing consisting of a 1 to 4.76 single reduction. The armature runs in roller bearings; the axle bearings are of the journal type with pad lubrication. The pinions are of chromium-nickel steel hardened and ground, and the gear wheels are of cast steel and made in two pieces, the rim being of chromium-nickel steel, with springs embodied in its construction.

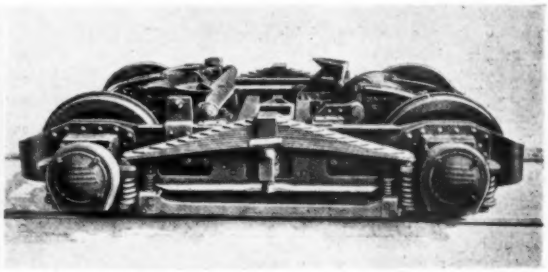
The controllers are of the cam-shaft, roller contact type adapted for series-parallel connection of the motors and for short-circuit braking. Altogether there are seventeen steps—six for series connection, four for parallel working, and seven for electric braking. The motors are connected in pairs, either in series or in parallel. The self-cooled starting and braking resistances are built up of cast-iron units in boxes mounted on the roof. The overload circuit breakers are mounted on the roof and can be operated from either the front or rear driver's cab. The lightning arrestor is also mounted on the roof next to the current collector, which is a pantograph provided with aluminium contact strips; the low resistance of the wide contact surfaces proves effective in reducing interference with reception on radio sets along the route.

The lighting installation comprises two circuits each with five 110-V, 40-W lamps, and three 110-V, 40-W lamps and one 220-V, 75-W head-lamp. The cars are heated in winter by four 1,200-W radiators connected directly to the overhead line in two circuits, with two heating steps, for 6.8 W and 3.4 W per cu. ft. of car space, respectively. Part of the starting and braking resistances situated under the seat can also be used for heating, the corresponding resistances on the roof being cut out of circuit.

The principal dimensions of the car are: Overall length 38 ft., maximum width 6 ft. 6 in., height of roof above rails 10 ft. 2 in., wheel base between centre pins of bogies 16 ft. 4 in., diameter of driving wheels 24¾ in. The complete car weighs 17 tons 10 cwt., of which the electrical equipment is responsible for 5 tons 4 cwt.



The pantograph collector



Details of the four-wheel bogie

Corona Losses at High Voltages

IN order to extend the range of experiments on 220-kV transmission line corona loss made at Stanford University and presented before the A.I.E.E. in September, 1930, and also to utilise the results for the economic transmission of Boulder Canyon power to the City of Los Angeles, further tests were carried out in the summer and autumn of 1931 at the same laboratory in collaboration with the Department of Water and Power, Los Angeles.

According to *Electrical Engineering*, the conductor specimens studied were a 1.125-in. hollow copper cable, a 1.149-in. hollow copper cable, and a 2-in. hollow aluminium cable. The 1.125-in dia. cable, of I-beam (Anaconda) construction, consisted of a single layer of 24 strands, each of 0.125 in. dia. The 1.49-in. dia. specimen was in a double layer, with I-beam centre, the inner layer containing 37 strands and the outer layer 43, each of 0.0971 in. dia. The 2-in. dia. cable was a single-layer type with the strands supported by a flexible-tube centre; the outside layer was of 30 strands of aluminium of 0.182 in. dia.

All losses were measured on a three-phase horizontally supported line 700 ft. long, having a clearance to ground of 30 ft. and a sag of 16 ft. Connected to one end of the line were three 350-kV 350-kVA transformers star-connected on the high voltage side, and delta connected on the low voltage. For measuring the losses, three single-phase dynamometer-type, high-voltage wattmeters were used, each connected directly between one line and earth. The current coil of the meter was connected in series with the transmission section and the potential coil connected directly between line and earth by means of a high voltage water resistor multiplier.

Die grease and other foreign matter found on cables as received from the manufacturers greatly increases the corona loss, which can be partially eliminated by washing the cable with a solvent soap solution and thoroughly rinsing in water. The cleaning of the cable surface by scratch brushing only slightly lowers the corona loss below that for a new cable properly washed. The polishing of a cable surface by buffing temporarily decreases the loss on the cable below that for a new cable properly washed. Dragging a clean cable for half-a-mile increases the loss on the cable above that for a washed cable, but the loss is less than for the new, unwashed cable as received from the factory.

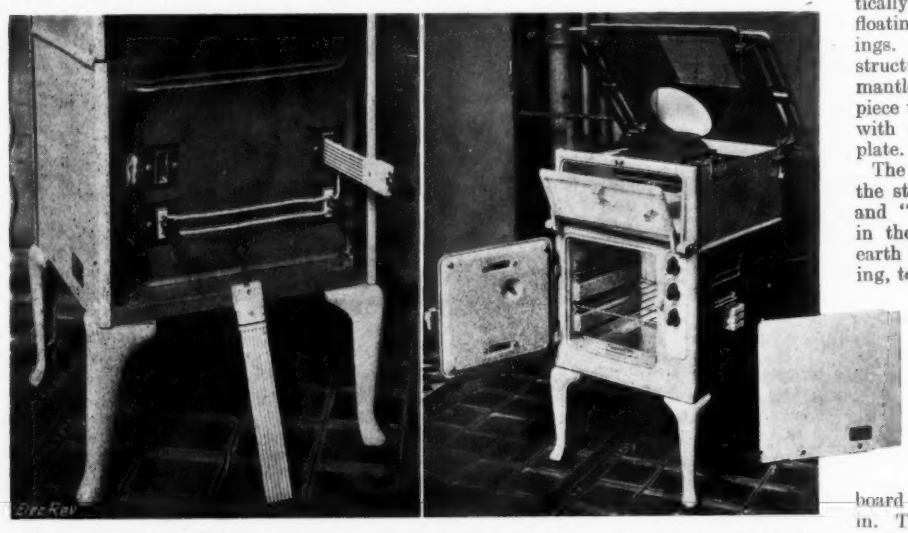
The surface of clean washed cables, which have been subsequently dragged, ages rapidly; so that with a year of weathering the loss is practically the same as found on a new, washed, undamaged cable. The surface produced by buffing ages quickly, and, as observed over one week's time, showed a great variation in loss which was not regular but at times approached the loss value as found for the new, washed cable. Insulator loss, if not considered, may introduce an appreciable error in corona loss measurements at high voltages. The loss can be partially eliminated by ensuring that the insulator strings are properly shielded.

A completely transposed line 1,050 ft. long showed the same corona loss as the same length of line untransposed. A horizontally spaced line showed a slightly higher loss than the same length of line with the equivalent triangular spacing. The losses on a rope-lay conductor are greater than on a concentric lay cable of the same diameter.

A New Cooker Design

ALTHOUGH there has recently been a good deal of talk about standardising cookers, new designs continue to arrive. The latest cooker is that of British National Electrics, Ltd., Mossend, Lanarkshire, and 28, Victoria Street, London.

This embodies a number of unorthodox but promising constructional features, the most outstanding being the fixed one-piece steamtight oven. There is no access to the elements from the oven interior, as these are contained in channels seam welded to the oven side. This avoids any possibility of grease or moisture being forced into the plug sockets or on to the elements themselves, and enables the oven to be swilled out with hot soda water, thus simplifying cleaning. Access to the oven elements is obtained from the back of the cooker by removing the cover of the cooker; then the elements, which are fitted with hoop handles, can be easily withdrawn, as shown in the illustration. They are kept in position by a slight pressure of the oven back on the projecting handle.



The method of withdrawing the oven elements from the back and (right) an "open" view of the C.10 cooker

The oven door, which is easily removable, is swung on machined pins which operate in steel liners. Two variable ventilators are provided in the door, or the cooker can be obtained with a fixed back vent, and the stem of the thermometer, also fitted in the oven door, does not protrude into the cooking space beyond a recess.

The boiling plates are each easily adjustable to hob level by three knurled thumb screws accessible from the hot cupboard with the hob in position. These can be locked afterwards by a nut. The boiling plates have "Chromalox" elements and both the boiler and griller have four-pin "plug in" connections with the leads and plugs shrouded from spilling. A handle is provided to enable the plugs to be drawn out vertically without straining the pins, floating contacts or porcelain housings. The sparred grid underhob structure can be completely dismantled without tools, and the one-piece welded hot-cupboard is fitted with a detachable sliding crown plate.

The "Arrow" switches are of the standard one-hole fixing type, and "Triumph" fuses are fitted in the side of the cooker. The earth terminal is in the front casting, to which all other parts of the cooker are bonded.

Up to the present two models have been marketed: the "C.10," which is priced at £11 16s. 6d. (standard finish), and has an oven cooking space 12¾ in. high, 12¼ in. wide and 12½ in. deep, and a hot cupboard measuring 6¾ by 16 by 17½ in. The oven element is loaded at 1,400 W, the grill-boiler (8 in. by 7 in.) at 1,600 W, and the boiling plate (8 in. diam.) at 1,550 W; alternatively, a 1,800-W embedded type boiling plate can be fitted. The overall dimensions are 37 in. high by 20¼ in. wide by 21 in. An enamelled shelf between the legs can be obtained for an extra 6s. 6d.

The other model, "C.12," is priced at £15 3s., and has an oven cooking space of 14¾ in. high by 15 in. by 14 in. loaded at 2,100 W, and the hot cupboard measures 6¾ in. wide by 19 in. by 19 in. A 1,800-W boiler-griller measuring 9 in. by 7 in., and a 6¾ in. diameter, 950-W boiling plate are incorporated with also a 1,500-W 8½-in. or 1,750-W 8¾-in. boiling plate. (Embedded type plates are available alternatively.) The overall dimensions are 37¼ in. high by 23¼ in. by 22½ in. The hob extension shelves can be fitted at an extra cost of 4s.

Electrical Contracts at Eastbourne.

FROM OUR OWN CORRESPONDENT

THERE was great expectation at Eastbourne Monday last that revelations would be made at the Council meeting as the result of a two days' private inquiry held last month, with the assistance of Mr. Wedderburn, barrister, into certain alleged irregularities with regard to electrical contracts, and the crush of the public at the doors of the Council Chamber was such that it had to be regulated by the police. It was stated that the minutes and the barrister's report on the subject had been received by the Council in committee, and would now come up for adoption.

The adoption was moved by Ald. Soddy, who said that the minutes and report related to certain irregularities alleged to have been committed by a firm of contractors to the Corporation and one or two other persons, with regard to which there had been a thorough investigation at which members of the Council were present. After consideration of the report the Council in committee had decided to accept the resignation of Alderman R. S. Chatfield, and he (the speaker) was glad to say that the resignation was made directly after Ald. Chatfield had given his evidence at the inquiry and previous to the report being received. The Alderman expressed his regret for certain indiscretions, and the Council appreciated the manner in which he had tendered his resignation. It was also decided that a special committee should be appointed to inquire into certain matters with regard to contracts, and further it was resolved that the whole of the papers and information should be submitted to the Director of Public Prosecutions.

The speaker went on to say that there was no desire for any undue secrecy about these extraordinary and unfortunate incidents, but as the proceedings were *sub judice* it would not be right for the minutes to be published in the ordinary way. Anyone perusing the minutes would find that many of the rumours in the town, especially concerning Ald. Chatfield, were exaggerated, and in some cases incorrect, and he counselled the burgesses not to circulate or believe anything that was not verified by fact.

Alderman Chatfield's Letter

The Council then formally accepted the resignation of Ald. Chatfield and reduced the usual fine to 5s. Ald. Chatfield's letter to the Mayor announcing his resignation was in the following terms:—

> "I felt it my bounden duty to appear before Mr. Wedderburn and admit, as I did frankly, my indiscretion in connection with this matter. This I regret and fully appreciate my error, for which I tender sincere apologies to the Council. I feel it my duty to place in your hands my resignation from the Council and to do it now, whatever Mr. Wedderburn in his report may have to say about me. I wish to express my sincere thanks to the members for their courtesy and kindness to me in the past. I have endeavoured to do my best for the benefit of Eastbourne, and I hope my future conduct will prove the sincerity of the great regret I feel for the circumstances which compel me to take this course. In conclusion, may I ask that the members of the Council will sympathise with me during this time, which is a great punishment to me, and not to judge me too harshly."

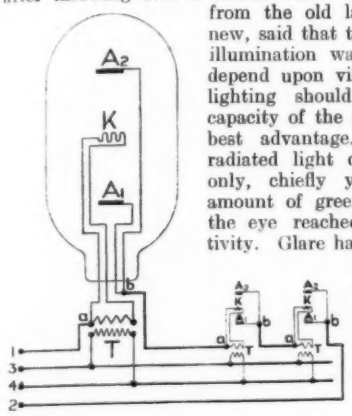
The Council expressed in its minutes appreciation of the straightforward manner in which Ald. Chatfield had communicated his resignation, while Mr. Wedderburn, we understand, reported that he found no evidence that satisfied him that Alderman Chatfield, as a member of the Corporation, had deliberately showed undue favour to the contractors in question, but while his conduct was not corrupt, it was improper and showed the absence of a due sense of the responsibility and obligations of his position.

Ald. Chatfield was the only Labour alderman on the Council, and he had been chairman of the Electricity Committee. He was the Labour candidate for the Eastbourne Division in the General Election before last.

The Sodium Gas-discharge Lamp

A new lighting installation on the Croydon by-pass road inaugurated

ON December 1st we witnessed the official inauguration of the sodium-lamp system by Messrs. Philips Lamps, Ltd., which extends for a mile outside the aerodrome on Purley Way, Croydon. The Mayor of Croydon, Ald. W. Peet, after throwing over a switch which transferred the lighting from the old lamp standards to the new, said that the main object of road illumination was safety, which must depend upon visibility of objects; the lighting should enable the visual capacity of the eyes to be used to the best advantage. The sodium lamp radiated light of a few wavelengths only, chiefly yellow (with a small amount of green and blue) in which the eye reached its maximum sensitivity. Glare had been eliminated.



The arrangement of the system

The sodium lamp contains neon gas and a small quantity of metallic sodium, together with an oxide-coated filament cathode, K in the diagram, and two anodes, A1 and A2. Those in use at Croydon are connected thirty in series, to d.c. mains, 1 and 2, fed via Philips rectifying valves from the existing three-phase system.

Starting the Discharge

The cathode is heated by a.c. from the secondary of a transformer, T, situated in the cast-iron top of the fitting. When the filament glows, voltage is applied to the anodes and an arc discharge takes place, the initial red colour being determined by the neon gas. The resulting heat causes the sodium to vaporise, and thereafter the radiation is carried principally by the sodium vapour. About twenty minutes is required to bring up the full illumination. To accelerate the initial heating and to reduce the energy input necessary to maintain the temperature between 200 and 300 deg. C., the lamp is enclosed in a double-wall vacuum bulb measuring 2¼ by 5 in.

The a.c. filament takes 8 A at 2 V. The starting and discharge voltages are, respectively, 22 and 15 V; the anode current is about 5 A. The overall consumption of the lamp, transformer, &c., is less than 100 Wh per hour. The m.h.c.p. lies between 500 and 600, with a total light output of from 5,000 to 6,000 lumens, giving a brightness of approximately 44 candles per sq. in. In order to avoid complete extinction should one lamp break down, an ordinary incandescent lamp is connected in parallel with each lamp.

A system of staggered posts support asymmetric fittings with a distribution forwards of 75 to 80 deg. from the vertical and backwards of 25 deg. They are erected in such a way that longitudinal axes of alternate lamps (one on each side of the road) are in the same vertical plane. The main direction of the light corresponds to the traffic direction on the side of the road.

Comparison with the Filament Lamp

A good filament-lamp installation will show a variation factor of 18 (0.9 ft. candles underneath the lamps and 0.05 between) with 1.6 W per foot; the sodium-lamp installation at Croydon has a variation factor of 6 (1.1 and 0.18 ft. candles respectively), with 1.06 W per ft. The surface of the road shown in the illustration is very dark. Incidentally the photograph does an injustice to one feature of the lighting; the halations might give an impression of very noticeable light sources, whereas they are remarkably inconspicuous. About 300 W is required to produce 5,000 lumens with the filament lamp, as against 100 W with the sodium lamp, but Messrs. Philips claim that the real efficiency of the latter is six times as much, in view of the visual acuity with monochromatic light being twice as great.

At a banquet following the switching-on ceremony, Dr. Philips, responding to the toast of "Our Guests," proposed by the Mayor, said that the lamps inspected had been made in his firm's laboratory in Holland, but shortly they would be manufactured in England where the company had three factories giving employment to 4,500 people. He paid a tribute to the intelligence, character, and adaptability of the British workman when well treated. Lt.-Col. G. K. M. Mason (M.P. for N. Croydon), also spoke. Others present included Sir Andrew Duncan, Mr. F. N. Rendell-Baker (borough electrical engineer), who was responsible for the introduction of the sodium lighting installation, and representatives of several official bodies.

The sodium-gas lighting installation at Croydon

The Southampton Civic Centre

THE basis of the electrical installation for the new Southampton Civic Centre is a complete horizontal "ring main" of copper on the "Riserrod" principle (Grierson Patent), which has been run in the voids to the corridor ceilings of the lower ground floor. Six sets of rising mains have been installed, each comprising four conductors rated for a continuous load of approximately 70 kW; they are carried to the upper floors.

Solid copper rods or tubes insulated with a closely fitting sleeve of micanite, approximately 1 mm. thick, are used in place of insulated and braided cables. The distributing centres are laid out so as to be as nearly as possible vertically above each other and connected to the fuseboards on each floor by short lengths of cables or solid rod. At Southampton, where a three-floor building covers a 500 ft. by 500 ft. site, the ring main forms a flat or horizontal loop.

To connect this length of cable or rod to the main rods only involves cutting away a short length of the micanite sleeve and connecting the cable to a clamp.

Any normal addition to the connected load will form a comparatively small percentage of the total load on the set of conductors. Since the micanite insulation will withstand very much higher temperatures than either rubber or paper insulation, the load can be increased to a much greater extent than would be permissible with paper or rubber insulated cable. A pilot system of lighting is employed to avoid complete extinction, and a synchronised system of clocks is installed.

Twenty-four fuseboards are placed throughout the building; easy access from the fuseboards to the office bays is provided by the false ceilings to the corridors, with empty conduits installed to deal with extensions. Similarly, each office bay is tubed with two ceiling outlets, one wall switch outlet, and also one outlet on the window wall for use with either light or heavy duty socket outlets, but cables are provided to meet the present requirements only.

The main supply of energy in the centre of the town is given on the d.c. system; but the borough electrical engineer, Mr. W. G. Turner, with a view to providing for the future, arranged for an e.h.p. supply to be delivered to the new substation in the basement of the Assembly Hall where it will be metered at 400/230 V, controlled by an oil-immersed, ironclad switchgear. A common rate has been arranged for all classes of supply.

Messrs. Grierson, Ltd., were responsible for the design and erection of the complete electrical installation, the fittings being manufactured and supplied by Messrs. Higgins and Griffiths, Ltd., to the design of the architect, Mr. E. Berry Webber.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

A Growing Appreciation of Good Lighting

THE paper which was read in London on November 30th at the ROYAL SOCIETY OF ARTS by Mr. W. J. Jones, manager of the E.L.M.A. Lighting Service Bureau, was referred to last week. Incidentally, Mr. Jones commented upon the good lighting of the newer London "Underground" stations and rolling stock, in which the illumination was about 20 ft.-candles instead of the original 2 ft.-candles.

In the basement of Lloyds Bank in London there was a loading of 5.75 W per sq. ft.; in Claridge's Hotel banqueting hall the figure was 5.5 W; in the passages of the new premises of the Lighting Service Bureau it was 4.3 W; whilst in the new demonstration rooms of the Glasgow Corporation Electricity Department it was as high as 10 W. Such increased loading provided a considerable amount of heat, and it was not necessary to use the same amount of heating by way of radiators as would otherwise be required.

Mr. W. J. Jones, M.Sc., is manager of the London Lighting Service Bureau

In the subsequent discussion Mr. J. Good suggested that means should be taken to bring recent developments to the notice of the general public, because it was not sufficient that they should be described only to technicians. It was pleasing to notice that illuminating engineers now recognised that the chief purpose of illumination was to emphasise the form, shape, texture, or whatever it might be, of the objects or premises illuminated. Flood-lighting from above gave a false effect, as compared with flood-lighting from below.

Enhancing Architectural Features

Dr. E. F. Armstrong, commenting on glare, said that Mr. Jones should be taken to see some twenty-five miles of streets in the south of London which were not lighted by electricity, and he would then be able to appreciate what street lighting really could be like. Prof. C. R. Darling, referring to the statement that intensive illumination rendered a certain amount of heating unnecessary in rooms, said he doubted whether he would care to meet the bill for heating in this way with the present high charges for electricity in many places. Mr. R. O. Ackerley said that in flood-lighting the aim should not be to produce the same effect as was produced by daylight but to show up the architectural details in such a manner that the interest of the public would be aroused in a way that was not the case in daylight. To that extent we should be perpetuating the work of great architects.

Mr. Ll. B. Atkinson spoke of the enormous improvement in the lighting of the trains on the Underground railways, and said the public owed something to the company for what it was doing in this respect. Mr. B. P. Dudding referred to the danger of introducing ideas from abroad and expecting to apply them, without modification, to the conditions in this country. That aspect had now been taken care of, and modern ideas on lighting were being developed in this country with some regard to national traditions and conditions. Mr. R. H. Holmes complained of the difficulty experienced in reading the small print used for theatre programmes in some of the modern theatres. In some cases the architects seemed to have given more thought to lighting the architectural features than to the comfort of the occupants.

The Criterion of "Public" Lighting

The Chairman (Mr. C. C. Paterson), referring to Dr. Armstrong's remarks, said there was far too great a tendency on the part of some public lighting authorities to assume that undue brilliancy was good street lighting. If, however, every opportunity was taken by those who had to adjudicate upon such schemes to impress upon public authorities that the object of good street lighting was not to follow the standard of the saloon bar of the public house, we should see the disappearance of many street lighting schemes which at present existed.

Mr. Jones, replying to the discussion, said that the developments now taking place in connection with illumination for all purposes, and the desire on the part of the public for higher intensities of illumination, should offer every inducement to electricity supply authorities to produce tariffs which would assist this development. The problems of glare appeared to be a sphere for physiologists and psychologists rather than for physicists, and they deserved the closest attention.

Suggested Co-operation between Electrical and Heating Engineers

BECAUSE of the large number of names submitted for the discussion on Mr. A. H. Barker's paper, "The Relative Fuel Economy of Electricity, Gas, Oil and Solid Fuel as Heating Agents," at the INSTITUTION OF ELECTRICAL ENGINEERS, on Thursday last week (ELEC. REV., December 2nd, p. 816), the discussion was not completed, and the meeting was adjourned until December 8th. The most valuable contribution was probably the suggestion for co-operation between the Electrical and Heating Institutions.

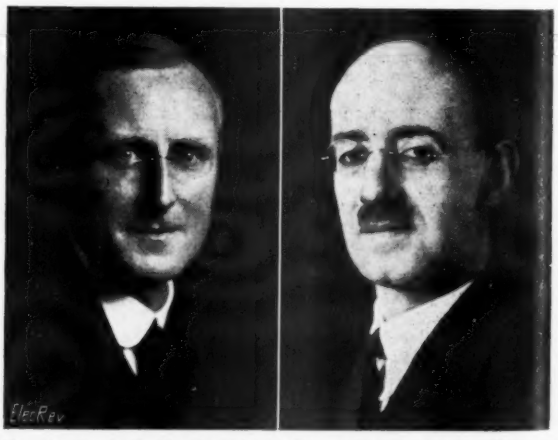
Opening the discussion, Lt.-Col. P. A. Hopkins, F.R.I.B.A., said that most of the arguments in the paper applied more particularly to dry heat. In large buildings where there were no partitions or doors to prevent the free circulation of air he found heating by convectors to be the most successful, and he believed there was a great future for the use of electricity in this way. Could not some form of air ozonating equipment be incorporated with the convector?

The Possibility of Error

Mr. H. Hobson (Central Electricity Board) said the paper was built up step by step by such a very complicated series of calculations that he was left with the rather uncomfortable feeling that through the possibility of the multiplication of errors, conclusions might have been arrived at which contained errors of such a magnitude as to vitiate entirely the ratios which the author had said were average and general ratios rather than specific. In asking for information on air conditioning, he mentioned that quite a big business in this connection was growing up in America. Mr. J. L. Musgrave said that if heat were supplied continuously during the night a substantial building absorbed sufficient heat in its structure to enable the external supply of heat to be dispensed with in the daytime, except in very cold weather. That was a question of very great importance, and he urged that the Institution of Electrical Engineers should co-operate with the heating engineers concerning it. Heating engineers had provided the money for research at Watford, but results would be forthcoming much more quickly if electrical engineers co-operated.

Mr. W. Richardson quoted cases in which the cost of electric heating in large buildings came out at lower figures than those mentioned in the paper, and said that the high efficiency shown for gas was obtained at the expense of a vitiated atmosphere. Mr. J. I. Bernard (E.D.A.) asked if, after all, fuel economy was the prime consideration. Why should not electric heating be dealt with in the same way as design calculations for other electrical equipment, proceeding on the basis of factors of safety? The net cost of heating was the thing with which the user was concerned, and not allowances for efficiency made in various stages, as was done in this paper.

Mr. J. W. Cooling (president, Institution of Heating and Ventilating Engineers) suggested that if one building only



Messrs. E. H. E. Woodward and W. A. Carne, joint authors of "An Analysis of the Costs of Electricity Supply and its Application in Relation to Various Types of Consumers," read before the North-Midland Centre of the I.E.E. on Tuesday evening

had been dealt with (and other papers given on other types of buildings) more useful results would have been obtained. He believed that the costs given for coke and oil would be criticised as too high, and complained that the author had compared thermostatically controlled systems with oil- and coke-fired systems which were not thermostatically controlled. There was no difficulty in applying thermostatic control to any heating system. A better case would have been made out for electricity if the author had taken into account the cost of installation, depreciation, &c., but even when that was done the user did not take into account the factors of convenience, cleanliness, &c., either as regarded electricity or gas. He would like to remove the impression that air conditioning was new in this country; it had been used here for the past thirty years. The Institution of Heating and Ventilating Engineers would be delighted to co-operate with the Institution of Electrical Engineers in an endeavour to solve the knotty problems associated with the heating of buildings.

Mr. E. M. Young, referring to the general question of the type of calculations used by the author, said that his own experience confirmed their accuracy, and those who doubted this would soon be assured by an examination of the practical results available to support the method. The cost of operating auxiliaries in the case of oil-fired boilers had not been taken into account and this might be considerable in small plant. The author's comparisons with regard to electric thermal-storage were surprising, but buildings in which the water heating requirements were large compared with those for space heating could not really be regarded as coming within the scope of the paper.

A novel van, with a trailing power plant, for demonstrating cake-making. **(See page 870)**

Electricity and the Motor Car

AUTOMOBILE electrical equipment is dealt with in a paper which Mr. K. R. Sturley read before the London Students' Section of the INSTITUTION OF ELECTRICAL ENGINEERS on December 9th. It is pointed out that the cheaper cost of production and greater reliability due to better design have been responsible for the return of coil ignition to popularity during the past two years. Both coils and magnetos are described, while lighting and battery-charging apparatus (dynamo, cut-out, and ammeter) receive adequate treatment. The two types of dynamo, *i.e.*, constant-current and constant-voltage, and the methods of maintaining these conditions over a wide range of speed are dealt with.

Torque/speed and torque/current curves for the average starter motor, and the two methods of lessening the shock of engagement, are given. The Bendix system accomplishes this by means of a spring coupling, and the "Axial" type by a special electrical device which first supplies a small current to the motor and only switches on the full-load current when the pinion of the starter shaft has made proper engagement with the flywheel of the engine.

Among electric warning devices the electric horn has now practically superseded all others. There are two types and in both the sound is produced by vibration of a thin metal diaphragm, either by interrupted electromagnetic action or by a ratchet fitted on the shaft of a small motor revolving at a very high speed.

Electrically operated windscreen wipers have the advantage of steady action unaffected by the speed of the car or the condition of the engine. They can be divided into two classes, the non-self-starting iron armature and the self-starting wound-armature type. The latter is now replacing the former, as it has usually a considerably greater reserve of power and will operate double arms.

A steam and an electric train in Brighton station, to which the Southern Railway electrification has been extended

How to Choose Fuel for Steam Generation

THE first part of the long paper which Mr. H. L. Pirie read before the East Midlands Section of the INSTITUTE OF FUEL at Nottingham on December 9th has the self-explanatory title: "The Theory and Practice of the Gasification of Coal in the Furnaces of Steam Generators." The author states that he is driven to the conclusion that the only sure guide in the selection of coal for steam raising is practical trial, and he claims that this view is confirmed by the fact that many large power stations set aside one boiler exclusively for the purpose of evaluating coals before placing contracts for supply.

The technique of operation has vastly improved in post-war years, but it would appear that progress must be slow until the status and wages of the firemen are raised to the level of those obtaining in the so-called "skilled" trades. The education of boiler-house employés in the art of stoking is receiving attention, but it appears to the author, human nature being what it is, that it is a forlorn hope to expect the fireman to put into practice the benefits he may derive from a course of instruction unless he is to receive adequate financial reward for so doing.

Some types of stoker are entirely unsuited to burn certain varieties of coal, but it should always be possible to select a coal and choose a stoker which together will give maximum efficiency for any given set of conditions. Settings and arches play an important part in combustion in water-tube boilers. The load, furnaces, grates, and coal must be considered both severally and jointly. Although it is manifestly impossible to lay down hard and fast rules it will generally be correct to aim at the use of coal having the lowest volatile content which will carry the maximum load to which the boilers are subjected, and give the greatest number of B.th.u. per unit of price and ultimate cost.

The industry is well served by its trade associations, but there would appear to be room for a less commercial organisation for the purpose of dealing authoritatively with standardisation and research and to enable closer contact to be made between producer and merchant. There is much to be done in the way of standardising screen sizes, nomenclature, blending problems, and research. The inroads which oil fuel is making are very serious indeed and the best means of defence is attack.

The second section of the paper is entitled "The Theory and Practice of the Combustion of Solid, Liquid, and Gaseous

Industrial Fuels Compared with Coal for Steam Raising." In it the author says that gaseous fuels are competitive with coal, which is the raw material from which they are made. It is useless to try to impede progress by detracting from their use. The reduction in price of the commodities manufactured by their employment should result in increased demand and more coal should be required in the industries concerned.

So many oil-fired boilers are simply converted coal-fired ones having burners in place of grates that this explains why the use of fuel oil has so often led to disappointment. With properly designed combustion chambers the boiler efficiency with oil may be high, but with incorrect design it is little better, if as good, as with coal. Oil in inexperienced hands is not so flexible as coal.

Ultra-short Wireless Waves

THE Marchese Marconi described in detail some results of his recent investigations into the properties and behaviour of very short electric waves in a lecture which he delivered in London at the ROYAL INSTITUTION OF GREAT BRITAIN on December 2nd. He said that electro magnetic waves under one metre in length were usually referred to as "quasi-optical" waves, the general belief being that with them communication was possible only when the two ends of the radio circuit were within visual range of one another, and that consequently their usefulness was defined by that condition.

About eighteen months ago he decided again to take up the systematic investigation of the properties and characteristics of those very short waves in view of the palpable advantages which they seemed to offer, *i.e.*, the small dimensions of the radiators, receivers, and reflectors necessary for radiating and receiving a considerable amount of electrical energy, and in view also of the fact that they did not suffer interference from natural electrical disturbances, such as atmospherics. In the lecture he described the apparatus which had been specially developed for his experiments, and illustrated his description with a series of pictorial and diagrammatic lantern slides which indicated the special features of the design of his new micro-wave transmitting and receiving equipment.

The Vatican authorities had adopted the new system for telephone communication between Vatican City and the Pope's Palace at Castel Gandolfo over a distance of 20 km. entirely over land, and screened by intervening trees. During tests in connection with the establishment of this service, the waves had to pass through all the masts and aerials of the high-power radio station of the Italo Radio Company at Terranuova. Following a series of experiments with waves of the order of 50 cm. length conducted between his yacht *Elettra* and the station at Rocca di Papa, near Rome, the most outstanding result of all his tests was the successful establishment of communication from Rocca di Papa to Cape Figari, Sardinia, over a distance of 168 statute miles (275 km.) on a wavelength of 57 cm., which demonstrated that these very short waves could overcome the supposed obstacle presented by the curvature of the earth, the distance between the two stations being considerably in excess of the optical range.

[*Elliott & Fry*

The Marchese Marconi

He felt that some of the practical possibilities of a hitherto unexplored range of electrical waves had been investigated, and a new technique which was bound to extend very considerably the already vast field of the applications of electric waves to radio communication had been developed.

Short-wave Radio Propagation

SOME characteristics of short-wave radio propagation are considered in the paper which Professor J. Hollingworth read (by permission of the Radio Research Board) before the Wireless Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on December 7th.

The author describes the phenomena observed when using a cathode-ray direction-finder on closed coils for examining received signals on frequencies of the order of 10,000 kilocycles per sec. The two outstanding features are the systematic appearance of certain cyclic forms, and the large values obtained for the horizontally polarised electric components. The former are then examined in the light of the magneto-ionic theory, and it is shown that the majority of them admit of simple explanation on this basis. The latter are chiefly of interest in raising the question of angle of incidence, which appears to be much less than is generally supposed.

[*Elliott & Fry*

Prof. J. Hollingworth was recently appointed to the chair of Electrical Engineering in Manchester University

From the evidence produced it appears that in general the magneto-ionic theory provides a reasonable explanation of the majority of the observed phenomena. In the more complicated cases, especially when dealing with long-distance transmissions, the proof is less rigorous. This is, however, probably due to the limitations of visual analysis of transient phenomena rather than to any breakdown in the theory, and it is probable that the photographic trace method, although it only gives two of the three quantities provided by the cathode-ray tube, may actually be of greater value owing to the permanence of the records.

The most striking fact arising from these results is that it appears definitely possible to have a signal from a station at a distance of 2,500 km. consisting of a single ray at an angle of incidence of 30 deg. Two or more other rays may be present, separated from this by appreciable angles. The persistence of this high-angle ray over considerable periods suggests that there are a certain finite number of possible paths for the ray which have a considerable degree of permanence, and that the apparent variations of angle of incidence of the incoming signal are primarily due to variations in the energy distribution between these fixed paths. It is extremely difficult to reconcile these results with the idea of multiple reflections, since a 30-deg. ray would roughly correspond to a tenth reflection (assuming a layer height of 250 km.), and it would be necessary to provide a mechanism by which all other rays, including those so closely related as the ninth and eleventh reflections, were totally absorbed or caused to vanish by electron limitation. At the same time it is possible that, although the general idea is sound, the extremely low angle of incidence (30 deg.) may be exceptional to this particular case.

It is emphasised that the results should not be regarded as a final and definite proof of any particular theory. This investigation was originally undertaken in a spirit of pure inquiry, to determine what actually did happen rather than to prove or disprove any accepted notions, but some of the results were so surprising that they inevitably challenged accepted ideas. Also, owing to the various limitations mentioned in the paper, the experimental results are not nearly as complete as the author would have liked to make them, and it is hoped to carry them much farther in the future. As limitations of time would, however, have led to considerable delay in their publication, it was decided to put them forward at once, but it is hoped that they will at present be regarded primarily as a statement of observed phenomena, the theoretical suggestions accompanying them being for the time purely tentative.

Electrical Thermal Storage

This is the title of the paper which Mr. J. Eden read before the London Branch of the ASSOCIATION OF MINING ELECTRICAL ENGINEERS on December 6th. The types of heating equipment control, and protective arrangements are dealt with; calculation data are given; and the preparation of specifications is considered. Very careful investigation is often necessary before one can decide to use high- or low-voltage equipment. The electrode boiler is a commercially practicable up to 5,000 kW, states the author, and would thus appear to meet the present requirements in this country. Immersion resistance elements have proved to be popular, mainly on the score of flexibility, and numerous installations up to 300 kW have been connected satisfactorily. Electrical thermal storage should prove to be a very useful source of revenue to the supply industry. During the past three years, however, progress has been comparatively slow because of the difficulty in obtaining suitable tariffs and the initial high cost.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

What Contractors Have to Endure

What is the electrical industry, which should be the grandest in the world, coming to? Every day those associated with it have to deplore the unfairness, stupidity and wasted energy which abounds and is increasing on all sides. Here is one of this week's samples: Installation firms throughout the country are invited to tender for the electrical installation at a hospital. Specifications will be sent on payment of £2 2s., *which will not be returnable.*

Former experience serving, thirty or forty firms will journey from near and far to inspect plans, view the site and prepare tenders at a probable average cost of £10 and pay £2 2s. each for the privilege.

The following is another case: £15 was spent in preparing a tender which was not acknowledged. All inquiries were ignored, until a registered letter enclosing a stamped addressed envelope brought a postcard saying "We should have thought that silence would have indicated the order has passed you."

Would any other industry or trade submit or respond to such treatment? How long shall we?

WALKER BROS., ELECTRICAL ENGINEERS, LTD.
H. E. Walker, *Managing Director.*

Birmingham, *November 30th.*

How to Sell Cookers

I happen to be one of the large number of people who attended the recent conference on electric cookers at the Caxton Hall. Through a long and amusing discussion the only point which appealed to me, as a woman, was the suggestion that hot-plates should be so constructed as to make slow simmering possible. From such a gathering one might reasonably expect a few more constructive suggestions. However, the main desire seemed to be to find something wrong with the other fellow. In addition, every cooker, it seems, must show a profitable return from the moment of its installation. Therefore I should like to make a few suggestions which, if of no use, at least cannot be worse than many of those to which I listened.

First of all, if a really genuine effort is made to please the various consumers, without so much regard to profit while in the experimental stage, surely good is bound to result. As an example, would it not be worth while giving away a complete set of utensils with each cooker? Or, alternatively, even to charge a little more for the cooker (complete with pans) in order to do this? After all, why should a housewife be expected to scrap a gas stove which she has probably found entirely satisfactory over many years in favour of an electric cooker, whose virtues she has yet to test and which will entail the buying of a really expensive set of pans? Furthermore, the fact that an electric cooker needs such very strong and costly pans is not in itself a recommendation to the layman.

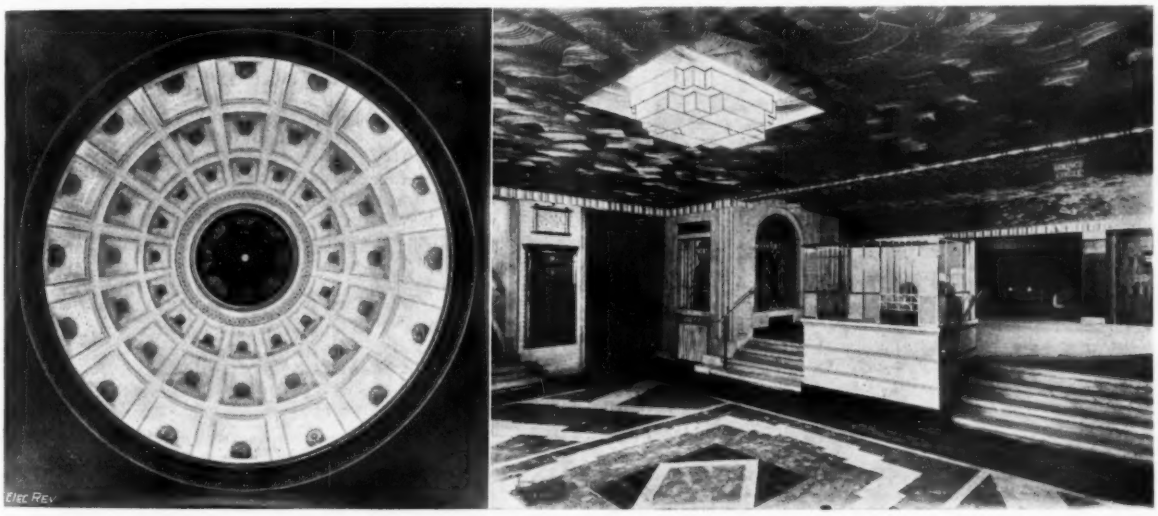
Advertisements and pamphlets are often too technical. The ordinary woman wants information given in a plain, straightforward way so that she can easily understand it. Then as regards demonstrations (the following remarks are not applicable solely to electric cooking demonstrations, but that is by the way), is it not comparatively simple to turn out beautiful cakes and so on when one has the best of everything to do it with—best flour, butter, eggs, meat, and all conveniences in the way of kitchen utensils, &c.? An electrical man told me that he was doing well with electric cookers in an exceedingly poor district. His method of demonstration was to go into the market, buy, say, 4d. worth of "pieces," a little rice, &c., and make a cheap stew—the sort of thing the user would have to do herself more often than not. It is fairly obvious that if cheap materials can be cooked successfully the expensive ones can too, but the inference is not the same the other way round.

I also feel that so much talk about "retained heat" is bad. It suggests to the economically minded person that she is wasting something if she doesn't use this heat. Thermometers, too, suggest complicated operation (until one has tried them, which the prospective customer probably hasn't); therefore, in addition to degrees all thermometers should bear the familiar indication of "hot," "very hot," and so on. It is futile to tell a woman that her gas cooker is all wrong, and that she is hopelessly old-fashioned if she doesn't cook electrically, &c. Gas cookers, as we all know, have a lot of convenient points, and it is up to the electrical industry to prove the superiority of their products without adopting the feeble attitude of running down their competitor's goods. Finally, the man who suggested as a solid reason for keeping apparently innumerable sizes and types of cooker the fact that Mrs. Jones would not have the same as Mrs. Smith is a very poor pyschologist. Mrs. Jones is far more likely to follow the example of Mrs. Smith if the latter has a reliable cooker than she is to say she wants something different.

Therefore, to sell more cookers it is necessary to concentrate on the wants of the user, not on what the seller thinks she *ought* to want. After all, everyone will make an effort to secure something he or she really desires, and if that something is a good article, then the seller is bound to profit in the long run.

ONLOOKER.

December 3rd.



"Sacred and Profane": two recent "Ediswan" lighting installations. The left-hand picture shows the dome of St. George's Church, Edinburgh, illuminated by eighty "Mirolux" trough reflectors (contractors, Pratt Bros., Ltd.); on the right is a view of the Regal Cinema, St. Leonards (contractors, H. E. Keen & Co.)

Upon Applying for a Post

Referring to the letter on this subject in the ELECTRICAL REVIEW of December 2nd, I think it is well known that some employers do not spend sufficient time in finding the right men to fill vacancies. Many advertisements in the "Situations Vacant" column are merely copies of other advertisements, and are not original or to the point. Some optimistic gentleman recently advertised for a traveller with a car and connection for a "commission only" appointment. A small advertisement in any paper these days stating that one has a connection brings forth many wonderful offers of discounts. The "Situations Vacant" column, even in these days of economy, is seldom, if ever, glanced at.

We all know about the thousands of letters received, but nowadays often an intelligent junior is employed to sort out the one per cent. wheat from the chaff. If it is any position at all, surely the person responsible can spare sufficient time to peruse the one per cent. Borough engineers still ask for testimonials, and the practice of manufacturing firms not to give testimonials to "axed" people causes great inconvenience. Personally, I prefer the practice of taking up references. After all, most testimonials state that the employé is all that he should be. If one is to send a photograph, is it advisable to have one's hair waved, prior to giving up a few hard earned shillings?

Many applicants these days have a little private business to carry on, pending the securing of another post, and to them time is of value. Perhaps some day some will learn that a man residing at the North Pole does not wish to take up a position at the South Pole at 30s. a week, and will state the district. Many men have not time for the interview when they learn the name of the firm.

Leyton, E.10, *December 2nd.* W. PENSTONE, Grad.I.E.E.

The Mass Production of Cookers

In your report of the conference on cookers in your issue of December 2nd we note (on page 812) a paragraph under the heading "Is Mass Production Possible?" We are writing to disclaim any knowledge of the figure of £80,000 which is quoted as the cost of a suitable press for cooker work, as possibly certain readers of your paper may, by mistake, associate this matter with our firm.

We could supply several presses suitable for cooker work at a figure far less than that quoted, and should any of your readers or Mr. Selley be interested in such particulars we should be only to pleased to go into the matter and submit a detailed scheme. MASS PRODUCTS, LTD.,

R. A. Baring-Gould, *Joint Managing Director.*

An Inquiry

I would like to know where I can obtain suitable electrical apparatus to light, and also chime a set of bells in, a model of a church. It is desired to work this apparatus by means of a penny in the slot, from 220-V d.c. mains.

Brixham, S. Devon, *December 5th.* V. D. LORD.

The Central Board's Tariff

With reference to the correspondence appearing in the ELECTRICAL REVIEW on the above subject, as concern regarding the grid tariff is developing I suggest that there should be a discontinuance of criticism.

I advise that the Central Electricity Board be approached asking for a deputation consisting of representatives of bulk purchasers to be received. W. FENNELL,

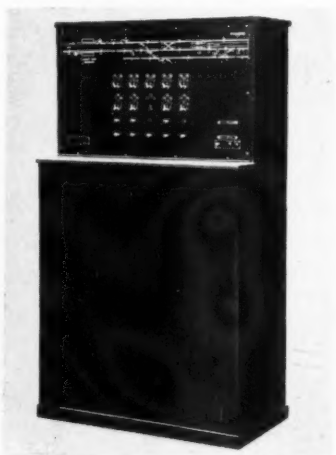
General Manager and Engineer,

Northwich, Mid-Cheshire Electricity Supply Co., Ltd.

December 6th (by telegram).

The Metropolitan Railway's Stanmore Extension

ELECTRICALLY, the principal point of interest in the new Stanmore extension of the Metropolitan Railway which is being inaugurated to-day (Friday) is the adoption for the first time in this country of centralised traffic control, the scheme and equipment for which was designed and supplied by the Westinghouse Brake & Saxby Signal Co., Ltd.



The control unit in Wembley Park signal cabin

The new line, which joins the Metropolitan main line about half a mile north of Wembley Park Station, runs in a northerly direction for 4½ miles with a steadily rising gradient to Stanmore. Normally, the layout of points and signals at the Stanmore terminus would require a staffed signal cabin with fifteen levers, but instead, the whole is operated from Wembley Park signal cabin by the existing staff by the adoption of the three-wire circuit code c.t.c. system.

On a panel in the Wembley Park cabin there is a layout diagram of the points and signals at Stanmore, below which are thumb-controlled switches corresponding to the points on the line. To move a pair of points from normal to reverse, the signalman turns the corresponding top thumb switch to the right and depresses and releases a start button below. This causes the code to be sent and, in turn, a relay to be energised, the point machine to be connected, and the points to be operated. After reversal and bolting of the points a relay at Stanmore breaks the circuit, resulting in the transmission of a code to Wembley Park, where a small lamp on the right side of the thumb switch is illuminated.

Simplicity of Control

The lower switches are for clearing or putting the signals to danger. When No. 2 switch is moved to the right and the button pushed and released, signal 2R. shows a yellow light and also the number of the platform road to which the train is signalled. When the signal is clear a yellow light is shown above the thumb switch. For danger, the operations are similar. In certain cases one thumb switch operates several signals. There is no inter-locking between the thumb switches at Wembley Park, and if the condition asked for is one which it would be unsafe to allow no operation will take place. The system installed could be readily adapted to an extension of the line or to cross-roads or goods sidings which might be provided between Wembley Park and Stanmore merely by the addition of panel equipment at Wembley Park and point machines and signals at the crossovers, &c.

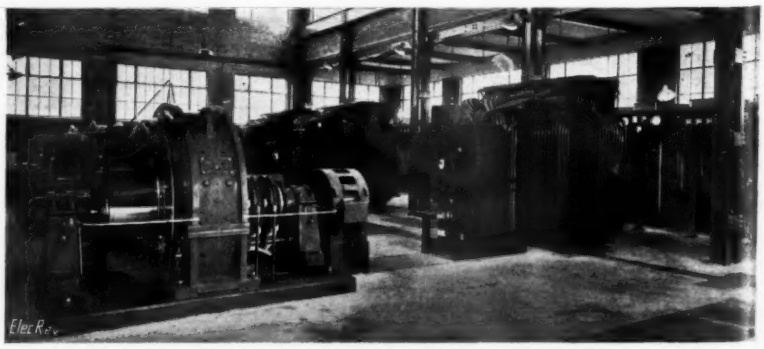
Insulated positive and negative rails are supplied at 600 V. d.c., from two new sub-stations, one at the junction and one at Cannons Park station. The sub-stations are fed from the company's Neasden power station at 11,000 V. Three rotary convertors at Preston Road (junction) are supplied from transformers at 440 V, and run at a synchronous speed of 400 r.p.m. Reactance "pull-in" coils render the machines practically self-synchronising. Each machine has a continuous output of 1,500 kW, and the combined efficiency of each transformer-converter set is 94 per cent. at full load, with a power factor of 0.97 per cent. leading.

Feeders and Switchgear

The large number of positive track feeders, ten as against five negative feeders, is due to the fact that the sub-station is at the line junction, so that advantage can be taken of its ability to improve the voltage on the main line and to relieve the adjacent sub-stations of a proportion of the increased load from the extra trains.

Only two rotary converters are installed at Cannons Park with four 600-V track circuits. Owing to the distance from the power station, it has been possible to utilise 11,000-V switchgear with a rupturing capacity of only 350,000 kVA, as against 500,000 kVA for the switches at Preston Road. Except for these variations the equipment is identical with that at Preston Road.

The cables were supplied and installed by British Insulated Cables, Ltd., and the sub-station equipment was supplied and put in by the General Electric Co., Ltd.



A general view of Preston Road sub-station showing three 1,500-kW rotary convertors, with starting panels and three 1,800-kVA transformers

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

An All-wave Choke

The LONDON ELECTRIC WIRE COMPANY AND SMITHS, LTD., Church Road, Leyton, E.10, have sent us a new "Lewcos" all-wave choke which has extremely good characteristics. It is screened and has a wavelength range of 15 to 2,000 metres.

The "Lewcos" all-wave choke

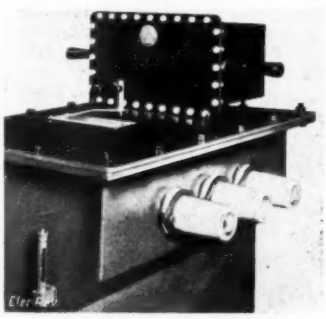
The instrument has a spaced winding of enamelled copper wire on a deep-ribbed former in series with a hank-wound medium- and long-wave winding. This winding has a definite self-capacity which is in series with the short-wave winding, thus reducing the total self-capacity of the winding to a very low value.

The base moulding has valve-pin spacing for fitting into a standard valve-holder, the "plate" pin being connected to one end of the medium-long-wave coil, the "grid" pin to the end of the short-wave coil, and one filament pin to a copper screen for earthing. The fourth pin is a "dummy."

The makers consider this model, which sells at 6s. 6d., 25 per cent. more efficient than the standard "Super" h.f. choke and 90 per cent. more efficient than the "Midget" on wavelengths below 60 metres.

A Transformer On-load Tap Changer

The type "P" transformer tap-changing equipment developed by MESSRS. JOHNSON & PHILLIPS, LTD., Charlton, S.E.7, enables maintained-circuit voltage control to be inexpensively applied even to the smallest transformers. It comprises an externally operated radial-type tapping switch fitted inside the main transformer tank or in an auxiliary tank, while external to the main tank is a portable, detachable, anti-short-circuiting reactor, which is connected in the tapping-switch circuit through substantial self-aligning contacts. The external reactor may be removed from the transformer simply by withdrawing it from the transformer contacts after a tap-changing operation has been performed. It then may be transported to another situation, there to perform a similar duty.



An external reactor inserted in the cover of an indoor transformer

All the necessary operations involved in changing from one tapping to an adjacent tapping are performed by a single movement of the external tapping-switch handle, which simultaneously registers on a weather-resisting dial plate the particular tapping in use, the dial being marked in terms of primary or secondary voltage or percentage winding in circuit.

This type of tap-changer is applicable to either single-phase or polyphase transformers, and it may be used on systems up to 11,000 V for fitting on indoor, outdoor, or pole-mounting transformers. Where there are several transformers on a system, and providing there is not too great a divergency in their ratings, one external reactor will suffice for all the transformers.

Where tap-changing on-load is not desired initially, but may be necessary at some future date, the tapping switch forming part of the equipment may still be used, and merely by dispensing with the external reactor it may be employed as an ordinary off-circuit tapping switch. The type "P" tap-changer does not involve any change in, or additions to, the design of the transformer, and generally can be fitted to existing transformers, all that is necessary being to drill three holes in the tank side or tank cover, and connect in circuit the radial tapping switch. The design of the reactor and of the tapping switch is such that sparking is reduced to an absolute minimum.

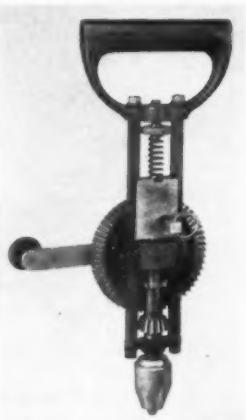
In order to ascertain the effects of the sparking on the transformer oil, an on-load tapping switch equipment was operated repeatedly throughout its entire range (five steps of 2½ per cent.) 200 times with the transformer loaded to 100 kVA at 0.8 p.f., the high voltage winding being connected to an 11,000-volt, three-phase, 50-cycle supply. Subsequent tests on the oil showed no change from its initial dielectric strength value, and no discoloration.

A Combined Hand Drilling and Plugging Tool

We have received from the E-KON-O-ME ENGINEERING CO., LTD., 125, Oldbury Road, Smethwick, a very interesting combined hand drill and plugging tool for electrical installation work.

With the new tool it has been found possible to jump holes for No. 8 Rawlplugs in good hard bricks at the rate of ⅛in.-¼in. per minute. When set for jumping it can easily be converted to a drill by pushing the pinion down the shaft into mesh with the crown wheel and disengaging the hammer peg and cam by pulling the attached ring. The strength of the blow can be regulated by a thumb-screw under the handle. All important parts are accurately machined and hardened.

The machine, which will not be marketed until just after Christmas, is the only one of its kind which we have described. Its price has been fixed provisionally at 27s. 6d. and it weighs 2 lb. 13 oz.



The "E-kon-o-me" drilling and plugging tool for jumping

A Magnetic "Fisher"

A useful device known as a magnetic "fisher" has lately been introduced by the MARTINDALE ELECTRIC CO., LTD., The Hyde, Hendon, N.W.8, for removing loose bolts, nuts, washers, cotter pins, &c., from inaccessible places. It is claimed that it will hold suspended approximately one pound of cold rolled steel and somewhat less cast or wrought iron. It can be operated from a 6-V battery, and takes a current of only 2 A. The instrument can be bent into various shapes to assist in reaching loose articles in awkward places, and is said to work satisfactorily even when immersed in oil.

Medical Apparatus

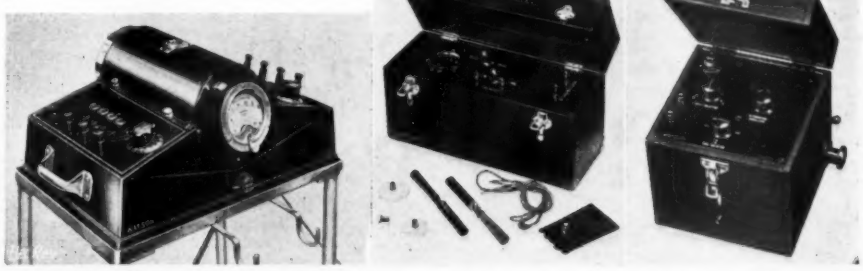
MESSRS. WATSON & SONS (ELECTRO-MEDICAL), LTD., 43-7, Parker Street, W.C.2, inform us that they have just developed several new lines.

One of these is the "Sunostat" universal machine designed as a single unit to supply various types of current used for therapeutic purposes, the power for illuminating surgical instruments, heating cautery instruments, grinding, polishing and sedimentation, &c. The apparatus is "earth free," so that if the patient is earthed he does not receive the force of the supply.

The "standard" and "treatment" models both give galvanic, faradic and sinusoidal currents, but the former also provides power for cautery and light and the latter is fitted to a four-cell bath commutator instead. The motor is fitted with a special end fitting for vibratory massage, grinding, &c., and its speed can easily be adjusted by a control handle. The price is £32 (d.c.) and £42 (a.c.).

The "Sunic" metal rectified galvanic and sinusoidal apparatus is designed for use on a.c. mains only. It is capable of delivering 80 mA at 80 V and up to 70 V sinusoidal current. The galvanic circuit is specially smoothed and the current is claimed to be constant and unvarying. The price is 13 guineas.

A universal machine; a galvanic and sinusoidal apparatus; and a Bristow coil

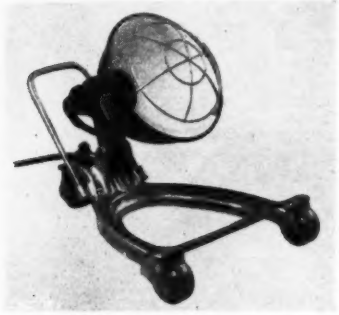


In the new "Sunic" portable galvanic battery the usual small dry cells are replaced by a 60-V battery. The control panel carries a milliameter (0-10 and 0-100 mA), a rheostat, a pole reverser, and a de Watteville switch. It is priced at 10 guineas.

The " Sunic " Bristow coil, used for producing faradic currents, is priced at £10 10s. The secondary windings and interrupter are mounted in a case with chromium-plated fittings, and at the top of the case is an ebonite panel carrying the necessary controls. A concealed four-way switch is fitted in order to bring the secondary currents into use layer by layer with distinct regulation of each adjustment by means of the primary core. An " on " and " off " switch, also of the concealed type, and plug and socket, are fitted so that the battery may be used on d.c. mains in conjunction with a suitable resistance. A special surging device and a gravity-type interrupter are incorporated.

An Inspection Lamp for Motorists

Among appliances for motor garage and repair shop use now being manufactured by JOSEPH BRADBURY & SONS, LTD., Braintree, Essex, is the " G.E." mobile light. It consists of a guarded electric lamp set in a reflector mounted on a light aluminium casting trolley running on three small wheels, the rear one of which has a castor action. The mobile light, which is fitted with eight yards of three-core cable, can be readily pushed into position under a motor vehicle and, as the reflector is swivel-mounted, the light can be directed on to any desired part of the chassis mechanism. The appliance is priced at 30s.



The " G.E." mobile light

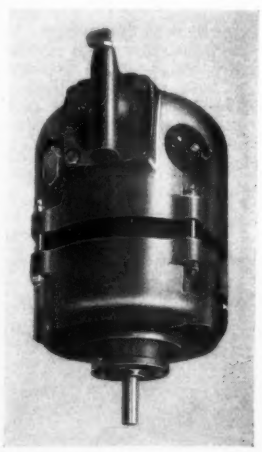
A Flat Alkaline Battery

BRITANNIA BATTERIES, LTD., 233, Shaftesbury Avenue, W.C.2, announce that they are now manufacturing, in addition to their tubular-type alkaline battery, a flat alkaline battery of the nickel-cadmium or nickel-iron type. This has been introduced to meet the demand for a cheaper type of steel battery than has hitherto been available, and a larger range of capacities has been produced to meet the demand of various applications for which these batteries can be used. This new battery is suitable for ship and yacht lighting, standby lighting batteries, and for a variety of applications. Among the advantages of these batteries is a lower resistance which makes them suitable for omnibus lighting and starting. They will also absorb current at a lower rate than the tubular type and can be employed in conjunction with a trickle charger.

Flameproof Fractional H.P. Motors

The latest development in connection with fractional h.p. motors made by the BRITISH THOMSON-HOUSTON CO., LTD., Rugby, is a range of flameproof models designed particularly for the operation of kerbside petrol pumps. These flameproof motors are also eminently suitable for use in mines, paint and chemical factories, and in other places where inflammable vapours are present. The machines adhere rigidly to the designs and tests demanded by the Mines Department, which is the official authority for testing and certification of flameproof apparatus.

Both the a.c. and d.c. motors of this new type have been tested at Buxton by this authority. The examination which the motors have to pass includes filling the motors with the appropriate highly explosive vapour, and then placing them in a flameproof chamber, which is in turn filled with vapour similar to that in the motor, and sealed. A spark is then generated within the machine, such as could occur normally in practice; the explosion thus caused inside the motor must not ignite the surrounding vapour in the chamber.



The new B.T.-H. flameproof motor

The a.c. machines are of the repulsion-start induction type, while those for d.c. circuits are of the compound-wound type. All the motors are equipped with ball bearings, and their mechanical and electrical design is of the highest possible character. The ratings of the machines are as follows: a.c. 50 cycles, single-phase, ¼ h.p. for 1 hour, ⅓ h.p. continuously; d.c. ½ h.p. for 1 hour, ⅓ h.p. continuously.

The motors can be supplied for vertical mounting, and motors for horizontal mounting are in course of development. The machines incorporate a double-pole tumbler switch of robust character in the flameproof casing, the switch being actuated by a push rod operating in a flameproof traverse. This feature saves the expense of providing a separate switch in a flameproof casing, and also effects considerable economy in space.

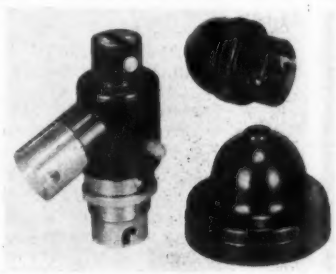
Each motor is sent out complete with two line leads connected to the motor windings, and one earth lead, the leads being sealed into the terminal box with high melting point compound.

" Bakelite " Accessories

MESSRS. S. CARO & CO., 153, Great Hampton Row, Birmingham, are marketing a new design of " Bakelite " two-way adaptor finished in brown or walnut. The switch has a push-bar action, is of the q.m. and b. pattern, and is priced at 3s.

Ceiling roses are available in white, walnut, or brown, and the " kidney " plates are of heavy gauge brass; the prices range from 6s. 6d. to 10s. 6d. per doz.

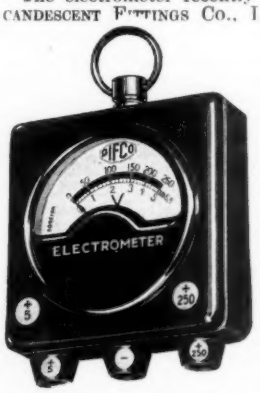
A new " Bakelite " cord grip s.c. lampholder has a reinforced heavy gauge brass liner, and it is claimed to be impossible to part the liner from the " Bakelite " because of the special method employed in binding. The plungers are of heavy quality and are fitted with phosphor bronze springs, while the gripping of the cord is brought about by screwing up the cap, thus forcing the flex on to the bridge. The price is 6s. 9d. per dozen.



Some of Messrs. S. Caro & Co.'s " Bakelite " accessories

" Pifco " Instruments

The electrometer recently marketed by the PROVINCIAL INCANDESCENT FITTINGS CO., LTD., Pifco House, High Street, Manchester, costs 12s. 6d. It is extremely useful to the electrician and radio engineer for tracing faults, on both a.c. and d.c. circuits, and has a double reading of 0-5½ V and 0-250 V. The casing is made of black " Bakelite " and is supplied with a hanging ring at the back and a two-feet length of rubber-covered leads.



The " Pifco " electrometer

An " All-in-One " radiometer is also available at 12s. 6d. with which battery driven radio receivers can be tested. A " de luxe " model which can be used with battery or mains driven sets, and embodies a 125,000-ohm resistance, can be bought for two guineas, mounted in a black " Bakelite " casing.

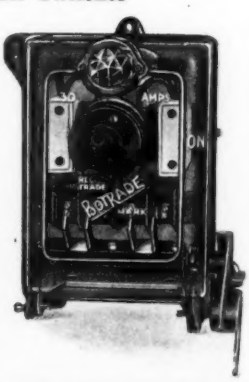
A Two-way Adaptor

Referring to the description of the two-way heat and light adaptor in our issue of November 25th, page 786, Vessco, Ltd., 11, Red Lion Square, W.C.1, state that they are the sole distributors for the whole of England with the exception of London, for which Mr. E. Kramrisch acts as distributor. The price has been fixed at 3s. 9d. each retail, and the company and Mr. Kramrisch distribute to the wholesale and export trade only.

" Botrade " Cooker Switches

The new cooker switches manufactured by MESSRS. S. BILL & CO., LTD., Queen's Road, Aston, Birmingham, incorporate a main control for the cooker with a fused pilot lamp circuit and a plug and socket sub-circuit for a kettle.

The main switch is the " Botrade " model " Q "; the fuses are of the damping-type with phosphor-bronze clips. Type C 2000 (22s.) has one 30-A 3-pin plug and socket with controlling switch, while model C 2005 (also 22s.) is supplied with one 5-A standard 3-pin plug and socket, 30-A switch, two 15-A fuses and pilot lampholder; type C 2010, selling at 25s., is the same as type C 2005 with an additional 5-A heavy-duty tumbler switch.



The " Botrade " C 2005 cooker control switch

A cooker control switch of the type described was recently operated 250,000 times as a test, and was found to be in perfect condition afterwards.

Inadequate Mains: Indifferent Employés

Two handicaps which must be overcome

By R. D. REYNOLDS, A.M.I.E.E.

Mr. R. D. Reynolds is consumers' engineer to the West Gloucestershire Power Co.

UNFORTUNATELY there are in this country a large number of old low-voltage networks that were never designed to carry loads considered usual to-day, and shortly after a few cookers and heaters have been connected to them complaints arise. The difficulty of meeting such complaints is greater after the apparatus which precipitates the trouble has been installed as a result of the efforts of a zealous member of the undertaking's sales staff.

The speed with which electric cookers are connected may depend entirely on the reports of the first one or two consumers to adopt electric cooking; if voltage conditions are bad, they are certain to be unfavourable. A large expenditure on mains may be undertaken to put matters right, but, because of the bad start, it will probably take many years to overcome the prejudice engendered. A thorough investigation into the capacity of mains to deal satisfactorily with such loads should be undertaken, and any necessary alterations or reconstruction work carried out before encouragement is given to the use of heavily loaded apparatus.

Some undertakings, knowing that almost the whole of their distribution system is unsuitable for the supply of a much increased load, keep their prices at a level which definitely discourages the use of heavy current consuming apparatus. The difficulty arises more frequently when undertakings have a mixture of old and new systems, and the commercial development policy is designed to suit the latter. In this case, it would be well to prepare a list of all districts, and sections of districts, in which it is inadvisable to connect heavily loaded apparatus, instruct all assistants accordingly, and otherwise refrain from encouraging this class of load in these districts.

National publicity, together with the undertaking's own publicity and propaganda work, will create a certain amount of this undesired demand in the districts under consideration. When this arises it is advisable to inform the consumer frankly that it would be best to defer installation of the apparatus until alterations to the mains have been carried out. It is better to lose immediate business than to encourage the installation of electrical apparatus which will be discarded later.

If discrimination in the selection of districts for the encouragement of heavy current consuming apparatus were strict throughout the country, the total amount of such apparatus connected to date would be greater, and the rate of progress more rapid.

Employés and Commercial Development

The adult inhabitants of this country have been brought up to believe that electricity is expensive. A large proportion of the people employed in the electrical industry take no action to discourage this idea in the minds of the general public with whom they come in contact; in fact, many of them by their statements definitely hinder electrical progress. This is often due to ignorance, masquerading under a guise of knowledge, and a lack of appreciation of the necessity for everybody engaged in all branches of the industry to encourage the use of electricity whenever they have an opportunity of doing so. The following are recent and typical examples that have come to my notice:—

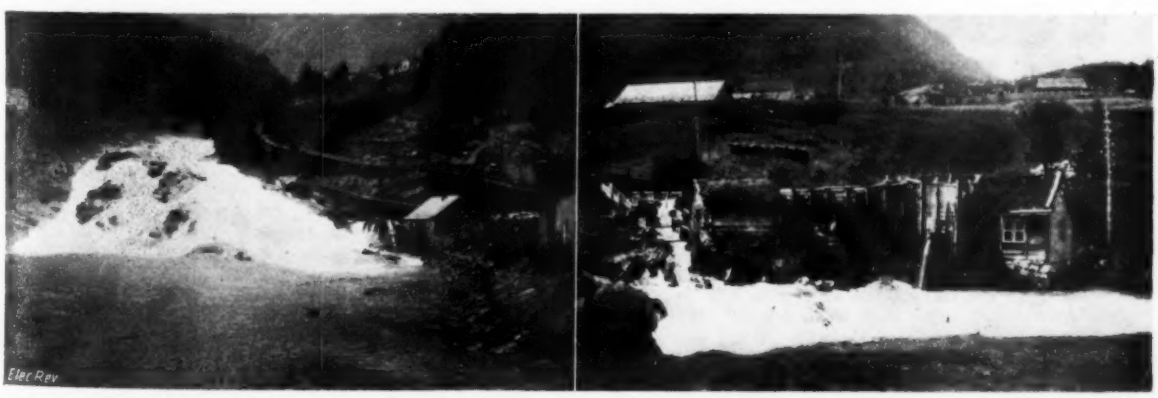
A householder stated, when there was a likelihood of electricity becoming available in his road, that he considered it expensive and so did not propose to take a supply. On being questioned it was found that he had no experience of the use of electricity, but had formed his conclusions on the basis that "everybody says it is very dear," and also because an acquaintance employed at the local electricity works advised him that it would be more costly than gas. Another householder stated that his house had been wired for lighting but not for heating, because a wiring contractor's employé informed him that at present electricity was too expensive for the purpose. Electricity is supplied in this case under a rateable value tariff, with a secondary charge varying from 1d. to ½d. per kWh.

Before we can hope to eradicate from the minds of the public the idea that electricity is dear, we must educate all employés engaged in the industry to the necessity for giving the electrical cause every ounce of their support at all times. A disparaging word about electricity from an employé, of any grade or class, does untold harm, because the general public thinks that he knows. At present, large numbers of employés not directly engaged on sales work consider, for some unaccountable reason, that they can take a detached and impartial view and that there is no necessity for them in private to uphold the cause of electricity. On this account, therefore, I suggest the institution of a national movement that would have as its object the recruitment of all persons engaged in the many branches of the electrical industry as a great propaganda force.

A Matter of Education

In carrying out such a plan the first object of the organiser would be to obtain the interest and co-operation of the employers: this should not be difficult, and once obtained, the education of the employés could begin. I believe that a booklet explaining why it is in their interests to encourage electrical progress, and containing some notes on the uses of electricity, would prove of value. The booklet would point out to men engaged in the manufacture of switchgear, transformers and electrical instruments, that by encouraging amongst their acquaintances the use of electricity for lighting, heating, cooking, and other purposes, and by using it for as many purposes as possible themselves, they are creating a demand for the products of their labour, with resultant increased prosperity to the section of the industry affording them employment.

Information regarding electricity and its uses would be given. Some of the fallacious comparisons made by the gas industry could also be dealt with in a simple way. The gas industry's propaganda is particularly insidious, the misleading figures that they distribute being firmly believed in by a big proportion of the public, largely because of the general impression that electricity is dear. On this account, therefore, it is considered important that all persons employed in the electrical industry should have some idea how to meet statements and arguments that are being constantly advanced to show electricity in a disadvantageous light. In clubs and other places where men congregate conversation often turns on these matters, and our people should have some ammunition with which to meet attacks.



Two primitive Norwegian hydro-electric plants—(left) the Heelesylt station where only a fraction of the power available is harnessed, and (right) a station near Loen with a neighbouring corn-mill

In the Courts

THE Darlington Corporation was summoned under the Factories and Workshops Act on December 1st for having failed to observe certain electricity regulations at the municipal electricity works. The proceedings followed an accident in which Wilfred Langhorn, of Hebburn, an erector employed by Messrs. A. Reyrolle, Ltd., received a shock from a conductor charged at 6,000 V. He was not killed, but received serious injuries.

The Corporation summoned Harold Webster, a shift engineer, contending that he committed the offence without the knowledge or consent of the Corporation. It was alleged that Webster failed to disconnect after having assured Langhorn, who was fitting a plug and socket to a cubicle switchboard, that he had done so.

The Magistrates decided that no penalty should be imposed on the Corporation, but that Webster should pay £10 towards the cost of the prosecution. The Town Clerk, who appeared for the Corporation, said he would ask that the Electricity Committee should pay the £10, stating that the electricity works manager had the greatest confidence in Webster's capabilities.

A Lamp Royalty Dispute

On December 2nd Mr. Justice Langton continued the hearing of the action brought by N-V- "Splendor" Gloeilampen-Fabrieken, Holland, to recover from the Omega Lamp Works, Ltd., royalties amounting to £500. The defence was a denial that anything was due for royalties, and an allegation that defendants were entitled to repudiate the agreement as the plaintiffs had failed to take steps to prevent an infringement of their patent, and had also failed to communicate any improvements they had made or discovered in the method of exhausting "tipless" lamps, and defendants also counterclaimed for damages. Mr. N. E. Paine, formerly works manager of the original Nelson Lamp Co., and now a director of the Lustre Electric Lamp Co., gave technical evidence for the plaintiffs to the effect that the Nelson Co. had not infringed the plaintiffs' patent.

Mr. R. H. Quinnell, the proprietor of the Belgrave Electric Co., and formerly in the service of the Nelson Co., said that he went to the Nelson Co. as works manager in March, 1929. The methods which the Nelson Co. adopted for lamp exhaustion were not the same methods as those of the "Splendor" Co.

On December 5th Mr. Wilhelmj Van Heyingen, examined by Mr. J. P. Eddy, for the plaintiffs, said he was managing director of the plaintiff company. The persons responsible for the invention of "tipless" lamps were people employed in their works. He was not the personal inventor, but he took a responsible position on the technical side of the works. His company obtained a grant of the letters patent in December, 1926, and they granted the defendants the licence in December, 1927. So far as he personally knew there were no infringements in 1929.

In June, 1929, when he received notice that the Nelson Electric Company was using their exhaust methods, they gave instructions that if the company had been guilty of infringement it should be proceeded against. In October, 1929, they received a communication that the Nelson Company had altered their method of manufacture, and he accepted that statement as being correct. In the Nelson method the exhaust tube was different, and he then came to the conclusion that the Nelson Co. was not infringing the patent. In September, 1929, his company had made experiments for the purpose of making an "improvement" in the method of exhaustion, which "improvement" it was said they had failed to communicate to the defendants. They were at that time only experimenting and they never got any patent from the Patent Office for the alleged "improvement," as it was too near a French patent.

Cross-examined by Mr. Hancocks, he agreed that it was not until after this action was started and the defendants had refused to pay any more royalties that he came to the conclusion there had been no infringement by the Nelson Co. He did not think anyone had stopped their solicitors from issuing a writ against the Nelson Co. The latter company, while denying that it had infringed their patent, said that it was taking steps to do something different. The Nelson Co. for four months had been making lamps which, in his opinion, at that time were infringements. No proceedings had been taken in this country impugning the validity of their patent.

On December 6th Mr. Herbert Van Os, the agent of the plaintiff company in this country, gave detailed evidence as to the steps taken to prevent the alleged infringement of the patent by the original Nelson Electric Co. and the pressure put upon the latter company. During his cross-examination Mr. Hancock (Counsel for defendants), read a letter written on behalf of the Nelson Co. which stated that if the Nelson Co. was satisfied that it had infringed the plaintiffs' letters patent it would be prepared to give an undertaking that it would not continue to manufacture under that method.

His Lordship considered that such an undertaking was perfectly worthless.

Mr. Eddy, on behalf of the plaintiffs, said the issues in the case were these: First, had the defendants failed to establish that there had been any actual or contemplated infringement of the plaintiffs' patent? Secondly, did the plaintiffs in fact take steps within six weeks from the receipt of the notice dated May 29th, 1929, with a view to preventing the alleged infringement? Thirdly, whether, as the six weeks from May 29th, 1929, having expired on July 12th, 1929, the defendants had waived the notice by manufacturing under the licence after that date and paying royalties?

He (Counsel) submitted that this point as to waiver was absolutely fatal to the defendants in this case. Further he submitted that the defendants had acquiesced in what the plaintiffs did and were doing to prevent any alleged infringement.

The hearing continued until December 7th when judgment was reserved.

Sequel to an Escalator Accident

In the King's Bench Division on November 30th Mr. Justice Swift heard an action brought by Mr. Alfred M. Bryant, an artist, against the London Electric Railway Co., to recover damages for personal injuries sustained through the alleged negligence of the company or its servants. Mr. Bryant's case was that on June 6th this year he was leaving the Hyde Park Corner Station by the escalator when it momentarily stopped or jerked, with the result that he was thrown down and injured. In giving evidence Mr. Bryant said that he was seventy-eight years of age, and as a result of the accident he had suffered from shock and had been unable to do any work since.

The defence was a denial of liability and negligence. The company said that it was impossible for the escalator, which was in perfect order, to have stopped or jerked in the way alleged.

His Lordship, in giving judgment, said that he came to the conclusion that there was no evidence of any negligence on the part of the defendants and there would be judgment in their favour.

Mr. Fox-Andrews, for the company, said his clients considered that Mr. Bryant's claim was a perfectly honest and honourable one and they did not ask for any order as to costs against him.

His Lordship said that he thought the company had acted with great propriety and accordingly entered judgment for the company without costs.

Large Heat-treatment Furnaces

A HIGH-POWER electric furnace of the soaking-pit type, installed in the workshops of the Ancien Etablissements Cail in 1931, has proved so satisfactory that it has been decided to build a second furnace of the same type. By using one furnace at relatively low temperature for preheating and annealing, while the other is restricted to high-temperature work, increased production and greater economy will be secured. The reason for adopting the pit-type furnace is that much of the work to be dealt with consists of locomotive connecting rods, crankshafts, gun tubes, and other long pieces which must be heated and quenched vertically in order to avoid distortion.

According to *Le Génie Civil*, the furnace has an effective depth of 18 ft. and a clear diameter of 39 in. Its total depth is about 21 ft. measured to the cover plate, which is capable of carrying pieces weighing about 5 tons. As the furnace pit had to be sunk in ground with a standing water level only 11 ft. 6 in. below the surface, the excavation was lined with ferro-concrete and an inner shell of steel plate, and a thick layer of lagging was placed between the latter and the cylinder of refractory bricks forming the furnace chamber. The heating elements consist of nichrome strips supported by projections from the refractory bricks. Guard rings or collars of nichrome let into the walls at intervals prevent the exposed heating elements from being short-circuited by pieces under treatment.

In the interest of economy the furnace is used during the night, when surplus power is available. An 800-kVA, 5,500/220-V, three-phase transformer supplies the existing furnace and will also serve the new one. The maximum power absorbed by the existing furnace is 380 kW, divided equally between the three phases. The furnace switchboard contains seven contactors, one for each heating circuit. The seven circuits are grouped in pairs from the bottom of the furnace, the top circuit (next the cover) being independent. The resistances in each circuit can be connected in star or delta as required. An electrical interlock prevents current being supplied to the furnace until the cover is in position. Signal lamps on the switchboard show which circuits are closed and whether in delta or star.

Corresponding to the four groups of heating elements there are four pyrometer tubes, connected automatically in succession to a controlling instrument, the pointer of which is set to the desired temperature. As soon as one or more of the pyrometers show that temperature to be reached, the corresponding heating element or elements are disconnected until a subsequent reading shows that heat is again required. The regulation is fully automatic and the maximum difference of temperature between the top and bottom of the furnace does not exceed 3 deg. C.

A New G.P.O. Engineer-in-Chief

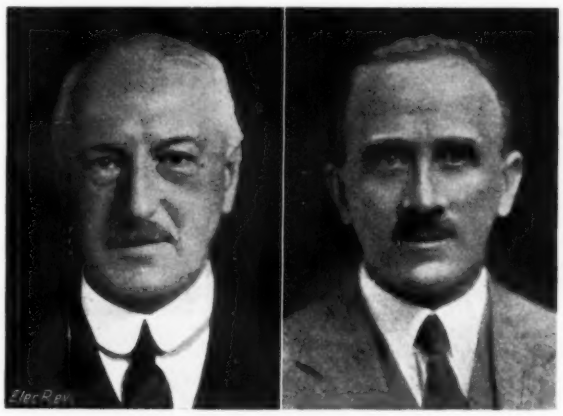
COL. SIR THOMAS F. PURVES, O.B.E., Engineer-in-Chief of the General Post Office, retired from that position on November 30th, and he is succeeded by Lt.-Col. A. G. Lee, O.B.E., M.C.

Sir Thomas Purves entered the Civil Service by open competition in 1889, and was transferred to the Engineering Department of the Post Office in 1892. He was appointed technical officer on the headquarters staff in 1900, assistant superintending engineer in 1905, staff engineer in 1907, assistant engineer-in-chief in 1919, and engineer-in-chief in June, 1922. During the war he served as major in the Royal Engineers, and at the conclusion was awarded the Military O.B.E. and was appointed hon. colonel of the 14th (London & Home Counties) Division of the Royal Corps of Signals, a position from which he retired in 1928.

He was awarded a knighthood in 1929, and in the same year was elected president of the Institution of Electrical Engineers, an outline of his career being published in our pages at that time (ELECTRICAL REVIEW, October 18th, p. 632). On retiring from the presidency of the I.E.E. he was appointed chairman of the Engineering Joint Council, a body set up in 1922 by the Institutions of Civil, Electrical and Mechanical Engineers and the Institution of Naval Architects in order to govern and co-ordinate the joint action and interest of the British engineering profession at home and abroad.

The development of the thermionic valve and other devices resulted in the possibility, on the conclusion of the war, of a European telephone network, and Sir Thomas played an important part in the development of telephony in its international aspects, persuading the German Administration to send delegates to the first real international telephone conference held in 1924. During his period of office as engineer-in-chief, he was called upon to make a decision which determined the future of automatic telephony in this country, and was responsible for the adoption of the "Strowger" step-by-step system.

He has held the position of engineer-in-chief to the Post Office for a longer period than any of his predecessors during the past fifty years, and has been in control of the Engineering Department throughout a time of unparalleled technical progress. At the time of his appointment in 1922 he prophesied that the coming ten years would see many remarkable developments, including full intercommunication between the telephone systems of Great Britain and the United States, all of which have been duly accomplished. He has been president of the Institution of Post Office Electrical Engineers since 1922.



Int. Rotogravure

Col. Sir T. F. Purves, who has retired from the position of engineer-in-chief of the G.P.O., and Lt.-Col. A. G. Lee, who is succeeding him

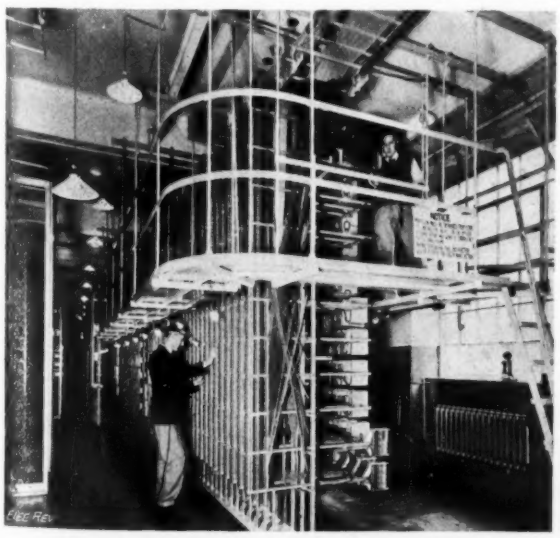
Lt.-Col. A. G. Lee, the new "chief," served with the Royal Engineers in France during the war, finishing up as Officer in Command, G.H.Q., Signal Area. After the war he took up radio work and played a prominent part in the development of the wireless station at Rugby. After this he assisted in the development of international wireless telephony, which commenced with the New York-London telephone service and has since grown to vast dimensions as a world-wide telephone network with the Dominions. For the last few years he has been responsible for the technical direction of the telephone and telegraph services in addition to wireless work.

He has been leader of the British delegations at several International Radio Conferences. In 1928 he was appointed chairman of the Radio Research Board, a post to which he brought considerable knowledge of the practical requirements of radio as well as intimate contact with research methods. In 1929 in recognition of his activities in the technical field of wireless he was elected vice-president of the Institute of Radio Engineers of America. He was elected chairman of the Wireless Section of the Institution of Electrical Engineers in 1927 and has been a member of the Council since 1931.

Mayfair's Telephones

THE new Mayfair exchange in Farm Street, Piccadilly, W., is the largest Strowger automatic installation so far completed for the G.P.O. in Greater London. The building will temporarily accommodate the equipment for four exchanges—Mayfair, Regent, Grosvenor, and Langham—the manufacturers and contractors being the Automatic Electric Co., Ltd.

The ultimate capacity of the three-fold Mayfair exchange (in which Langham will later be merged) will be 30,000 lines. Sub-division of the equipment applies only to the apparatus directly associated with subscribers' lines, together with the numerical and first code selectors. The remainder, including the directors, auto-manual equipment, and power plant is common to all three exchanges.



The main distribution frame of the Mayfair exchange

The new building comprises five floors and a basement, the latter accommodating the four main batteries, each of 25 cells, and having a present capacity of 9 890 Ah. The charging equipment comprises three E.C.C. (1,900-A, 57-V) generators, coupled to slip-ring motors running off the 400-V, 3-phase, 50-cycle public mains. Power distribution throughout the exchange is on the busbar principle.

There are four 4-A, 75-V ringing dynamotors, two for direct mains operation and two as stand-by for battery operation. The whole of the Strowger automatic equipment is mounted through the medium of channel steel shelves, on 700 single-sided racks, the "jack-in" principle of connecting individual components and switches facilitating permanent wiring. A system of floodlights, comprising 60-W and 100-W lamps, backed by steel reflectors, set at an angle of 45 degrees, and alternately attached to the fronts of opposing suites of racks, illuminate the surface of the equipment.

To facilitate inter-working between the existing manual and the newly converted automatic subscribers, the fourth floor of the new building is equipped as an auto-manual switch-room and accommodates nearly 100 "A" switchboard sections, twelve "B" sections, and twenty-six sections for associated toll services.

The design of the seven-digit director units constitutes an improvement in comparison with the earlier arrangement at Holborn and elsewhere. Only one directory listing is necessary to ensure connection with one or other of the disengaged lines of the particular group whenever the listed number is dialled. In the Mayfair group of exchanges this facility is secured through the medium of P.B.X. final selectors, which are installed throughout, and give common access to the first disengaged line in groups of 10, 20 and 200, respectively. The equipment includes voice-frequency key-sending apparatus, the latest development for setting up calls.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources, Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

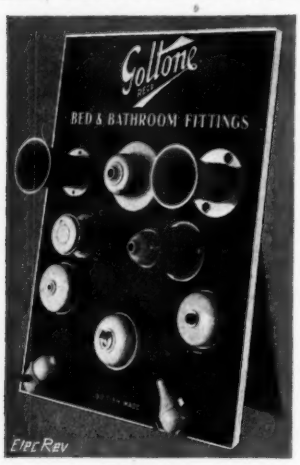
"Safety in Bed"

With reference to the leaderette in our issue of November 18th bearing this title, British Insulated Cables, Ltd., inform us that they have developed a flexible which contains two or more strong reinforcing cords laid up with the conductors, while the whole flexible is filled in with rubber and the braid is applied in such a manner that it adheres strongly to the surface of the rubber underlying it. The result is that the flexible is practically unkinkable and cannot be easily twisted. The inserted cords may be used to anchor the ends of the flexible so that the conductors are considerably relieved of stress.

Such a cord, if its end is firmly gripped and anchored as suggested, would enable the manufacturers of special heating appliances to guarantee a greater freedom from breakdown and security against fire.

Another Ward & Goldstone Sales Aid

A short time ago Messrs. Ward & Goldstone, Ltd., Frederick Road, Pendleton, Manchester, made available for dealers a very attractive showboard for general "Goltone" accessories and components. In a week or two a similar showboard will be obtainable especially for the display of "Goltone Ivorant" components for bedrooms, bathrooms, hospitals, &c. Only the components on the stand will be charged for, the stand itself being free. In appearance "Ivorant" components are ivory white, and the colour goes right through the moulding and is unaffected by atmospheric conditions. The various articles are held in position on the stand by means of self-adjusting clips. The showcard is suitable for either counter or window use, and can be hung up if desired.



The new "Goltone" display board

The Victorian Commission's Trading Activities

A conference has been convened by Mr. Macfarlan, the Minister in charge of electrical undertakings in Victoria, to discuss to what extent the State Electricity Commission should be permitted to engage in the retail distribution of electrical appliances.

Too Many Cycles?

A deputation from the Darlington Chamber of Trade has been appointed to interview the Electricity Committee to protest against the Corporation's selling electric clocks in its showrooms. The chairman (Mr. H. Green) said the matter was a serious one, as the Corporation's trading activities were growing apace and would have to be stopped. As a result of the change of frequency of the electricity supply in Darlington the electric clocks which were being sold by private traders gained five minutes every twenty-four hours. The Corporation had controlled the frequency to suit themselves.

Radio Trade in the British West Indies

A recent Department of Overseas Trade report states that the market for radio apparatus in the British West Indies is a somewhat limited one, with Trinidad and Jamaica as the chief importing islands. In these islands the demand is increasing while in the other islands the demand is by no means negligible. There are no broadcasting stations in this area and consequently listeners have to rely upon programmes received from Europe, the United States and South America. Having regard to the present exchange position, it is felt that it should be possible for United Kingdom manufacturers to produce a satisfactory set at a competitive price. It is imperative that receivers should be extremely sensitive owing to the distance from broadcasting stations.

The Duty on Electrical Exploders

The Import Duties Advisory Committee gives notice that it has under consideration an application for increased import duty on electrical exploders for shot-firing in mines and quarries. Any representations which interested parties desire to make should be addressed in writing to the secretary, Import Duties Advisory Committee, Caxton House (West Block), Tothill Street, S.W.1, not later than December 19th.

The Industrial Welfare Society

For the year ended June 30th last the Industrial Welfare Society's income was sufficient to meet all expenditure, wipe out the debit balance of £861 brought in from the previous year, and provide a surplus of £125.

A New Name

The Electrical Industries Benevolent Association (formerly known to everybody as the Electrical Trades Benevolent Institution or the E.T.B.I.) has called an extraordinary general meeting for Thursday, December 15th, at 11.30 a.m. It will be held at the Institution of Electrical Engineers, Savoy Place, W.C.2, and the object is to approve new rules. A confirmatory meeting will be held on January 19th.

New Electrical Showrooms and Extensions

The Colne Valley Electric Supply Co., Ltd., has opened showroom premises at High Street, Rickmansworth.

Barking Corporation Electricity Committee has approved plans for the proposed extension of the Electricity Department's offices and has decided to invite tenders for the work.

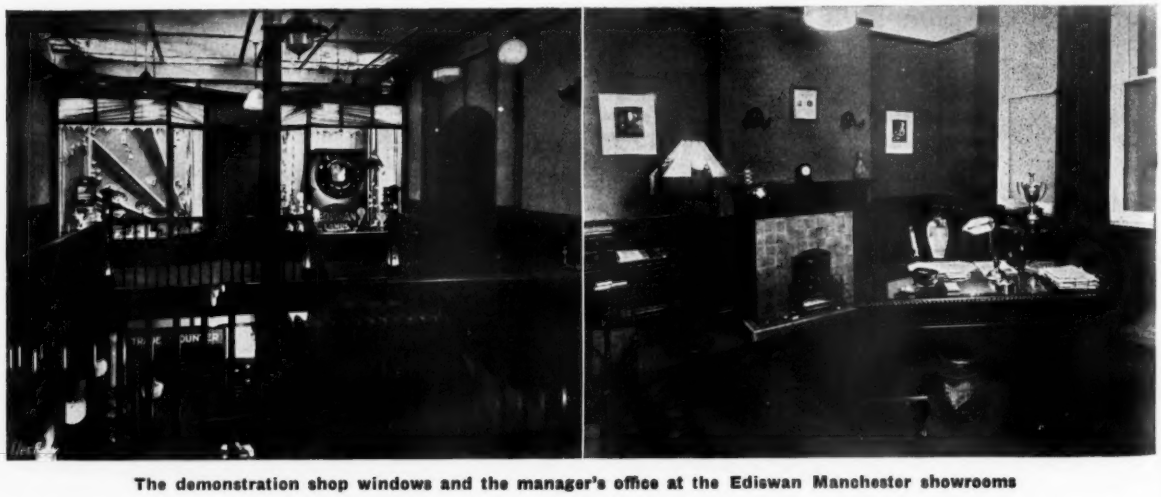
The Grays Urban District Council has applied for sanction to a loan of £1,750 for extensions to the electricity offices and showrooms.

The Manchester Ediswan Showrooms

The new showrooms of the Edison Swan Electric Co., Ltd., at Lloyds House, Albert Square, Manchester, were formally inaugurated on December 2nd by Mr. A. Watkins, chairman of the Manchester Ship Canal Co. There was a large gathering of representatives of the electrical industry and Manchester business men, who, after the opening ceremony, inspected the premises. An extensive range of electrical fittings for commercial and domestic lighting, and also a wide variety of electrical appliances and accessories were displayed. These showrooms follow others which have recently been opened at Birmingham, Norwich, Ipswich, and Bradford. Two views of the new showrooms appear in the accompanying illustrations.

The Electromatic System

Traffic-controlled street signals have just been installed in Liverpool at one of the busiest traffic intersections—Lord



The demonstration shop windows and the manager's office at the Ediswan Manchester showrooms

Street, North John Street and South John Street. They were put into operation by Alderman W. Muirhead with a silver key presented to him by Mr. Eades of the Automatic Electric Co., Ltd., with which he set the controls. The ceremony took place in the presence of the representatives of municipal authorities in Lancashire, Cheshire, and North Wales, as well as many members of the motor haulage industry. Following the inauguration of this first " Electromatic " vehicle-

A model of the " Electromatic " system

operating street traffic control in Liverpool, the guests adjourned to a local restaurant where the company exhibited a series of working models of traffic control signals.

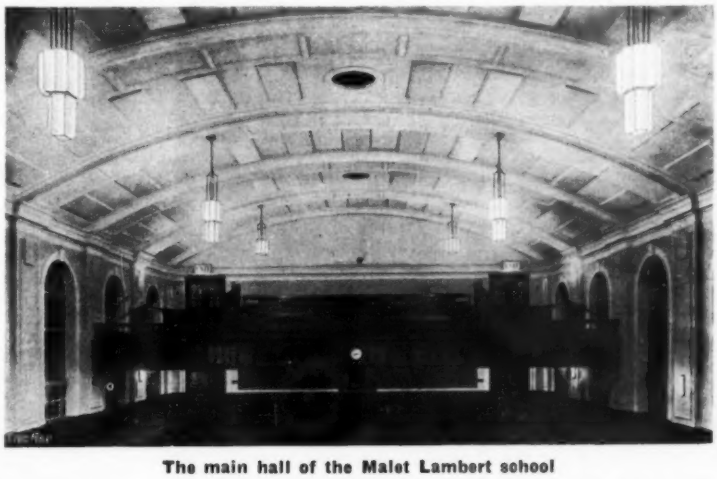
The Prague Spring Fair

The period of next year's Spring Fair at Prague is from March 19th to 26th. Firms interested in the Fair should apply for information to: Das Messeamp, Messepalast, Prague, VII, Czechoslovakia.

A School Lighting Installation

The recently opened Malet Lambert High School, Hull, is a fine example of a modern educational building. The main entrance hall is divided into three sections by beams, lighted by three 150-W units, which are symmetrically placed in each ceiling division, and the uniformity of the lighting leaves the impression of highly perfected detail design. The staircase is lighted by two special Holophane rectangular wall brackets, which fit neatly on the wall at the mid landing of the stairs, and give a mild amber glow to blend with the buff colour of the walls. The upper landing is a replica of the main entrance, over which it is directly placed. The first-floor corridors are adequately lighted by Holophane bulkhead units, recessed into the ceiling, the spacing being 20 ft. and the units 60 W, with 75-W lamps where a junction of two corridors require but one point. The lighting of the assembly hall is carried out with special " Pagoda " fittings. Over the main floor four two-tier units are used with 600 W per fitting, and over the gallery are two single-tier units of similar design, but having 400 W per fitting. Between the window columns are pagoda brackets fitted flush on to the wall. These units are small component parts of the larger units. Similar units are fitted beneath the gallery. The stage has a special batten of concentrating reflectors on four circuits. The art room has a special installation of " Focalite " fittings with semi-daylight screens as an aid to colour definition. The arts and crafts, wood work, and metal working rooms have special industrial units of the extension type, supplemented by special bracket points for local lighting. A similar scheme is carried out over the benches of the chemistry laboratories. The blackboards are also provided with special lighting. The gymnasium is equipped with Holophane industrial units close on the ceiling spaced 18 ft. apart.

The electrical work was carried out by Messrs. Miller & Garniss, Ltd., Hull, in collaboration with Holophane, Ltd., and the city architect.



The main hall of the Malet Lambert school

Trade Announcements

British National Electrics, Ltd., Mossend, Lanarkshire, are now manufacturing appliances for the domestic market. The J.P. Tubular Heating Co., Glasgow, is an associate company, and the chairman is Sir James Lithgow. Showrooms will shortly be opened in the West End, but meanwhile business in the London area is being carried on at 28, Victoria Street, S.W.1 (telephone: Victoria 2101) by Mr. W. L. Hambly, the company's London sales engineer.

Pope's Electric Lamp Co., Ltd., has opened two additional provincial branches. One is at 34, Prince of Wales Road, Norwich, and the other at 230, Old Christchurch Road, Bournemouth. The branches are managed by Mr. E. Satterthwaite and Mr. A. H. Plummer respectively.

Social Events

The annual staff dinner of the West Midlands Joint Electricity Authority took place under the auspices of the " Wemjea " Sports and Social Club, at the Victoria Hotel, Wolverhampton, on December 2nd. Ald. J. Bell, chairman of the Authority, presided. Mr. G. R. J. Parkinson, vice-chairman, proposing " The Club," spoke of the progress of that institution. Mr. F. S. Naylor responded, and Mr. E. F. Hetherington, chief engineer, proposed " The Chairman."

The members of the Electricity Supply Rifle League held their annual dinner and prize distribution at Pritchard's Restaurant, Oxford Street, W., on December 3rd, when covers were laid for seventy-six guests under the chairmanship of the president, Mr. G. C. Weston, of the K. & K. Club, supported by Messrs. J. R. J. Bowden (Hackney) and S. G. Nodes (London Power Co.), vice-presidents, and Messrs. A. R. Bacon (County Co.), H. P. Gaze (London Power Co.), and E. Harlow (City Co.), past presidents. During the evening the hon. secretary (Mr. E. Mathews) gave a brief *résumé* of the activities of the League and regretted that only Mr. Gaze and himself were there who had attended the initial meeting twenty-one years ago. The toast of the chairman was proposed by Mr. E. Harlow, of the City Co. Mr. G. C. Weston responded. An entertainment was provided during the evening by the Sparklers Concert Party.

The West Gloucestershire Power Co., Ltd., held its ninth annual staff social on December 3rd at Boot's Café, Gloucester. A company of about 100 enjoyed a pleasant evening. Among those present were Mr. D. Northall-Laurie (director) and Mrs. Northall-Laurie, and Mr. Harry S. Ellis (general manager and chief engineer) and Mrs. Ellis.

The London Power Co. held a supper dance on December 2nd at St. Ermin's Hotel, when the chief officials and staff of the company, together with their friends, numbering over 150, were present. Dancing commenced at 8.30 p.m., and, with an interval for supper, continued until 1.30 a.m.

The Swiss Radio Market

Imports of United Kingdom radio apparatus into Switzerland are at present hampered by the attitude of a Continental organisation which claims heavy royalties on all sets embodying screened grid or pentode valves, states a Department of Overseas Trade report. Subject to a satisfactory solution of this difficulty, Switzerland offers a good opportunity for trade, and although there has been a temporary decrease in demand owing to economic conditions, radio importers anticipate better sales this winter. The buying capacity of the public is high, and the market is unlikely to be saturated for some years. The Swiss have a high opinion of British sets, and are prepared to pay a good price provided their performance is satisfactory, selectivity being an extremely important point.

A Large Country-house Switchboard

The switchboard depicted on page 826 of our last issue was a product of Messrs. S. Bill (not Bell) & Co., Ltd.

Engineering Trade in India

At the monthly luncheon of the British Engineers' Association on Tuesday next at the Hotel Victoria, Northumberland Avenue, W.C.2, Sir T. M. Ainscough, C.B.E., H.M. Senior Trade Commissioner in India and Ceylon, will speak on

"Conditions and Prospects of British Engineering Trade in India."

Changes of Name

Messrs. L. McMichael, Ltd., Naylor's Estate, Wexham Road, Slough, Bucks, have changed their name to L. McMichael (Holdings), Ltd.

Messrs. J. V. Brittain & Co., Ltd., Back Glebe Street, Stoke-on-Trent, have changed their name to John Godden (Stoke), Ltd.

Electrical Coal-shipping Plant

New electrically operated coal-shipping staithes, built at a cost of £120,000, will be opened at Howden on December 16th by the Tyne Improvement Commissioners. The staithes will be operated by one man.

New French Companies

Among the companies recently formed in France are La Société des Forces Motrices de la Faye, Paris (5, Rue St. Georges), capital one million francs; La Société d'Amenagement et Construction d'Appareils Electriques, Paris (19, Rue Monsigny), capital 80,000 fr.; and La Compagnie Nantaise d'Entreprises Générales d'Electrification, Nantes (4, Rue Vauban).

New German Companies

Among the concerns recently organised in Germany are the Berlin Electricitäts Union Gesellschaft, Berlin, capital £420,000, to act as a shareholding concern, the Huth Gesellschaft für Fabrikation Elektrischer Apparate, Krietein, Breslau; and the A.E.G. Electric Co., Berlin, to market A.E.G. products in Asia, Africa, and Australia.

Progress of the Hotel Lighting Campaign

From reports received it would appear that good progress is being made in most districts in connection with the E.D.A.-E.L.M.A. Hotel Lighting Campaign. So far as national publicity is concerned, a series of six form letters and two booklets entitled "Bring Lights" and "Light in the Hotel," have been circulated to nearly 10,000 hotels throughout the country. No fewer than 171 E.D.A. Circles or Development Centres are co-operating in the preparation and submission of reports on the existing lighting of hotels and two new E.D.A. Circles have been established in the London and Home Counties Area. So far 200 hotels, including one important group of railway hotels, have applied to headquarters for information and advice, and definite business results have been reported from King's Lynn, Spalding, Lincoln, Wisbech, Keighley and Leeds.

Well-distributed lighting in the stock room of the Palace Hotel, Bloomsbury Street, London

Many lectures have been given to hotel proprietors and managers, and the Association is also in touch with 137 architects having connections with large hotels.

The campaign has drawn attention to a special illumination problem which has hitherto been neglected. Many hotels derive a good deal of regular revenue from the renting of "stock rooms" for the display of samples, but so far little heed has been paid to the lighting arrangements. Our illustration shows a stock room at the Palace Hotel, Bloomsbury Street, London, in which the uniform spacing of the lighting units and the provision of diffusing fittings ensure adequate and well-distributed illumination, and display the goods to their best advantage.

A Standard Specification for Synchronous Clocks

A British Standard Specification for mains-operated clocks has now appeared. The specification limits itself to the electrical characteristics of the clock, essential to ensure reliability in operation, and does not enter into mechanical details, except in so far as is necessary to ensure compliance with the electrical requirements. Special attention has been paid in the specification to insulation and other features affecting safety. The committee which drew up the specification consists of representatives of the I.E.E. Wiring Regulations Committee, the British Horological Institute, the Electrical Contractors' Association, supply authorities, and the manufacturers of a.c. synchronous clocks. The chairman is Lt.-Col. K. Edgcumbe. Copies of the specification (No. 472—1932) may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d. post free.

Electrical Equipment in Buildings

The first annual report of the Advisory Council of the Building Industry has just been issued. This Council, which was formed just over a year ago, is fully representative of all the interests involved in the building industry, and its main object is to secure the abolition of unnecessary restrictive regulations and bylaws which hamper building and establish in their place reasonable conditions which are in consonance with building progress.

An interim report of the Electrical Equipment Panel recommends, *inter alia*, that the I.E.E. Regulations should be so coded as to be of standard application to all buildings, and that the Ministry of Health and the L.C.C. should be asked to adopt them as their model for official wiring regulations. The Panel suggests that there is need for some special code of wiring for certain places of entertainment. The interim recommendations of the Lifts and Escalators Installation Panel are mostly concerned with protection against fire risks. It suggests that all escalators available to the public should be equipped with emergency "stop" buttons at intervals along the travel, fitted in glazed cases, for use by the passengers in case of accident.

New Zealand Electrical Imports

The value of imports of electrical apparatus into New Zealand during the June quarter of the current year totalled £183,494, of which goods of a value of £130,591 were taken from the United Kingdom.

Czecho-Slovakian Electrical Imports

The imports of electrical machinery into Czecho-Slovakia during October reached a value of 21,913,000 crowns, making a total of 619,772,000 crowns for the first ten months of the current year, as compared with 225,698,000 crowns in the corresponding period of 1931.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, Etc.	Price Dec. 7th.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£40	—
a Ammonia, Muriate (large crystal) ... ,,	£38	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19 15s.	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac T.N. ... ... per cwt.	£3	—
a Sulphur Commercial... ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3½d. to 3¾d.	—
a ,, Crystals... ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d.	—
METALS, Etc.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ,,	1/2 to 2/9	—
p Babbits Metal and Anti-fiction Metals—		
Grade I ... ... per ton net	£143	£2 dec
Grade II ... ... ,,	£101	£1 dec
Grade III ... ... ,,	£55	—
c Brass (rolled metal 2" to 12" basis)... per lb.	7¼d.	—
c ,, Tubes (solid drawn) ... ... ,,	9d. to 9¼d.	—
c ,, Wire, basis ... ... ,,	7¼d.	—
c Copper Tubes (solid drawn)... ... ,,	10d.	—
g ,, Bars (best selected)... ... per ton	£65	—
g ,, Sheet... ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£36 5s.	—
d ,, ,, Sheets ... ,,	£64	—
d ,, ,, Wire Rods ... ,,	£42	—
d ,, ,, H.C. Wire ... per lb.	6 d.	½d. dec
f Ebonite Rod ... ... ,,	1/3 to 1/6	—
f ,, Sheet ... ... ,,	1/3 to 1/6	—
n German Silver Wire ... ... ,,	2/2	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para fine ... ... ,,	5d.	—
i Iron, Pig (Cleveland No. 3)... ... perston	58 6	—
i ,, Wire, galve. No. 1, P.O. qual. ,,	£20	—
g Lead, English pig ... ... ,,	£13 10s.	—
g Mercury ... ... per bot.	£10 10s. to £11 5s.	5s. to 10s. inc.
e Mica (in original cases) small ... per lb.	6d. to 8/6	—
e ,, ,, medium ... ,,	4/- to 8/-	—
e ,, ,, large ... ,,	8/6 to 17/6 & up	—
p Phosphor Bronze, plain castings ... ,,	1/1d.	—
p ,, ,, drawn bars & rods ,,	10¾d.	—
p ,, ,, rolled strip & sheet ,,	10 ¯d.	—
p ,, ,, wire ... ... ,,	11¾d.	—
o Platinum ... ... per oz.	£9 10s.	—
d Silicium Bronze Wire ... ... per lb.	7 ⅜ d.	⅛d. dec
r Steel, magnet, in bars ... ... ,,	7¼d.	—
g Tin, Block (English)... ... ... per ton	£15² 1⁻s. to £15¹ 15s.	£1 15s. dec.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/1	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bol'ing & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

Calendars and Diaries

The North Metropolitan Electric Power Supply Co.'s calendar is always out of the ordinary, and this year has an etching of Old Temple Bar on the cover with coloured portraits, views, and still life studies on monthly sheets.

"Beatrice & Boris—a study from life" is the title of the attractive calendar sent us by Mr. Christopher Wade, of Messrs. Gabriel, Wade & English, Ltd.

Kings Patent Agency, Ltd., has issued a desk diary for 1933 which allows a page for three days and is bound in a stiff cardboard cover. A leaflet summarising the important changes introduced by the new Patents Act is included.

New Catalogues and Lists

Kandem Electrical, Ltd., 711 & 715, Fulham Road, S.W.6.—An abridged London stock list of motors and dynamos.

British Insulated Cables, Ltd., Prescot, Lancs.—Leaflets Nos. P.271 and P.F.101, dealing respectively with "Rockbestos" insulated switchboard wires and cables, and the new B.I. double tariff prepayment meter.

Agro Electrical Co., Ltd., The Sessions House, Clerkenwell Green, E.C.1.—An illustrated catalogue of bells, bell accessories and fuseboards.

Lighting Trades, Ltd., & Welsbach Light Co., Ltd., 51-55, Garratt Lane, Wandsworth, S.W.18.—Two catalogues—one relating to "Redot" electric fires and domestic appliances and the other to electric lighting shades.

Painter Brothers, Ltd., Hereford.—A folder referring to "P.B. Callender" steel poles.

Macready's Metal Co., Ltd., 7, Baron Street, N.1.—A card drawing attention to the company's forged steel blanks and rings.

Michael Black, Ltd., 80, Blythswood Street, Glasgow.—A 164-page illustrated catalogue of the new season's radio goods.

Electric Machinery Co., 28, New Union Street, Ancoats, Manchester.—A folder describing the "Rightway" pulley and wheel drawer.

Holophane, Ltd., Elverton Street, Vincent Square, S.W.1.—A coloured leaflet showing a number of lighting fittings suitable for lounges, restaurants, theatres, &c.

Adamsaid, Bentwick Street, Ashton-under-Lyne.—Particulars of a new spade of interest to cable firms, &c.

James McMillan & Co., 17, Surrey Street, W.C.2.—An illustrated booklet produced by Sieverts Cable Works, Sweden, on electrical heating in the garden.

Babcock & Wilcox, Ltd., Farringdon Street, E.C.4.—A catalogue containing reprints of a number of the company's recent advertisements.

Goodmans, 27, Farringdon Street, E.C.4.—A leaflet illustrating various types of loud speaker.

Edward G. Herbert, Ltd., Atlas Works, Chapel Street, Levenshulme, Manchester.—Leaflet No. S.8 describing the "Rapidor" high speed sawing machines.

Sun Electrical Co., Ltd., 118 and 120, Charing Cross Road, W.C.2.—A "Suncomains" electric clock folder which is available for overprinting.

British Rema Manufacturing Co., Ltd., Halifax.—A folder (No. P.C.1) giving particulars of a new automatic clutch.

English Electric Co., Ltd., Stafford.—Publications Nos. 67, 69 and 70 dealing respectively with flameproof motors for mines, closed air circuit motors, and electric haulage; also a leaflet (No. P.33) on the elimination of trolley-bus interference with radio reception.

East London Rubber Co., 29/33, Great Eastern Street, E.C.2.—The 1932-33 catalogue (96 pages) of electrical fittings and domestic appliances.

Klaxon, Ltd., 36, Blandford Street, W.1.—A catalogue of "Klaxon" electrical products which include fractional h.p. and geared motors, sliding resistances, audible industrial signals and staff locators.

Switchgear & Equipment, Ltd., Banbury.—An illustrated folder pointing out some of the merits of the "S. and E." disconnecting switches.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—Several publications relating to switchgear, plugs, Holmes "Castle" type totally enclosed a.c. motors, and the "Reymez" pedestal washbasin with a self-contained electric water-heater.

L. G. Hawkins & Co., Ltd., 30-35, Drury Lane, W.C.2.—Leaflets dealing with "Tricity" fires, "Supreme" silvered glass shop-window reflectors, and "Universal" domestic appliances. Also the Christmas number of the "Link."

R. F. Winder, Ltd., Belgrave Electrical Works, Leeds.—The December list of surplus new and second-hand electrical materials.

Jackson Electric Stove Co., Ltd., 143, Sloane Street, S.W.1.—The December blotter illustrating the 91-J cooking cabinet.

Walker Bros. (Electrical Engineers), Ltd., Quality House, Temple Row, Birmingham.—The Christmas shopping number of the "Electrical News" containing suggestions for electrical Christmas gifts.

William Geipel, Ltd., Vulcan Works, 156-170, Bermondsey Street, S.E.1.—A leaflet illustrating and describing a new mechanical hammer just put on the market.

M. & C. Switchgear, Ltd., Kelvinside Works, Kirkintilloch, Glasgow.—Pamphlet No. K.81/4 on metal-clad oil-break switchgear.

Davy Brothers, Ltd., Park Iron Works, Sheffield.—A catalogue (No. 60) of plastic moulding presses and equipment.

Bankruptcy Proceedings

Wm. H. J. Willcox, radio dealer, 66, Soundwell Road, Staple Hill, near Bristol.—The public examination was held recently at the Guildhall, Bristol. A statement of affairs was submitted which disclosed liabilities of £365, with a deficiency of £263. The debtor attributed his failure to "insufficient capital and lack of business ability in dealing with the credit side of his business." The examination was closed.

Bradleys, lately carrying on business as electricians, 234, Vauxhall Bridge Road, S.W.—The statutory first meeting of creditors was held on December 5th at London Bankruptcy Buildings before Mr. H. Wheeler, Official Receiver. The receiving order was made on November 11th upon the petition of Messrs. L. G. Hawkins & Co., Ltd., and the only proof of debt tendered was on behalf of Messrs. Brown Bros., Ltd., creditors for £110. It was stated that the debtor had not attended under the proceedings and nothing was known regarding his present movements. The estate was left in the hands of the Official Receiver, who will apply for an order of adjudication to wind it up in bankruptcy.

A. Lester, wireless dealer, formerly 35, Farringdon Road, E.C., and trading as "Aldersgate Radio," 37, Aldersgate Street, E.C.—At the statutory first meeting of creditors held last week at Bankruptcy Buildings, W.C., a statement of affairs was submitted showing liabilities of £5,687 and assets of £197. It appeared that the debtor's name was Albert Mundelkern, and that he had never actually traded as above, although he had tried to do so. He formerly carried on business in Thavies Inn, E.C., in partnership with one Marquis as importers, chiefly of German goods, and in 1927 they had formed a company called Beam, Ltd., with a capital of £5,000. His insolvency had arisen from the failure of this company, from liabilities under guarantees given on its behalf, and from the stoppage of the business of Lester & Marquis owing to the imposition of tariffs. The meeting was adjourned.

This 75,000-kVA transformer weighing 100 tons—the largest ever made by Messrs. Ferranti, Ltd.—is on its way to be installed in the Central Electricity Board's sub-station adjoining the Clarence Dock power station, Liverpool

C. Marquis, wireless dealer, 9, Farringdon Avenue, E.C., and formerly company director, 35, Farringdon Road, E.C.—The statutory first meeting of creditors was held last week at the London Bankruptcy Court The liabilities were roughly estimated at £15,000 against assets "nil." The debtor attributes his failure and insolvency to the stoppage of a business carried on by him and one Albert Lester in Thavies Inn, E.C., to the failure of Beam, Ltd. (now in liquidation), and to his liability under guarantees. A resolution was passed for Mr. E. H. Hawkins to act as trustee of the estate.

C. Shepherd, radio engineer and wireless accessories dealer, 69, Micklegate, York.—Application for discharge to be heard January 10th at the Law Courts, Clifford Street, York.

J. E. Connell, electrical engineer, 2, Russell Street, Downing Street, Manchester.—Discharge suspended for four months until February 28th, 1933.

C. Bassham (Ashton & Holt), 16, Cross Street, Ryde, I. of W.—Last day for receiving proofs for dividend December 16th. Trustee, Mr. F. H. Langmaid, 87, High Street, Portsmouth, Official Receiver.

T. S. S. Southwood, electrical engineer, Pound Farm, Whyke Road, Chichester.—Supplemental dividend of 8d. in the £, payable to-day (Friday), at 8, Old Steine, Brighton.

C. A. Whittington, electrician and wireless dealer, 400, Abbeydale Road, Sheffield.—Public examination January 12th at the County Court Hall, Bank Street, Sheffield.

J. R. Lister (Roland Radio), 6, Watford Way, Hendon.—Trustee, Mr. W. Broad, 21, Bedford Row, W.C., appointed November 23rd.

Company Liquidations

Harris, Williams (Servis), Ltd., electricians and wireless dealers, 180-182, Albion Road, Stoke Newington, N.—Under this compulsory liquidation the accounts show total liabilities of £35,098 (ranking £26,844), assets £8,254 (absorbed in debenture claims of £16,000), and a total deficiency of £46,842 with regard to contributories, the issued capital consisting of 19,998 ordinary shares of £1 each. The failure of the company is attributed to the failure of a firm for which it was sole distributor, to supply appropriate goods, resulting in a loss of about £20,000, to the fact that the company did not determine the contract and seek more reliable manufacturers, to an arrangement made with a bank for financing the company which was not carried through, and to the acquisition of the assets of Selectors, Ltd., which appeared to be very promising but which resulted in a further heavy loss owing to the company's not being able to develop that business properly through lack of capital and proper organisation. Mr. A. J. Osborne has been appointed liquidator with a committee of inspection.

Home Electric, Ltd., wireless dealers, 24, Sackville Street, W.—Under this compulsory liquidation the accounts show total liabilities of £5,511 (ranking £5,408), net assets of £1,214, and a deficiency of £4,268 with regard to contributions, the issued capital consisting of 75 ordinary £1 shares. The failure of the company is attributed to lack of capital and to heavy charges for financing the hire-purchase business. Mr. H. A. Snelling has been appointed liquidator with a committee of inspection.

Electricity Supply

Lighting, Domestic, Power

Banchory.—NEW SUPPLY INAUGURATED.—The town's electricity scheme carried out by the Grampian Electricity Supply Co., was officially inaugurated on December 1st, the supply being switched on at the power house by Mrs. Burnett, wife of Provost Burnett, and the street lighting by Dr. G. Cran, a former member of the Town Council. Arrangments are well forward for giving supplies to a number of public and private buildings, the present charge for electricity being 8d. per kWh. Members of the Town Council and their wives attended the power house for the opening ceremony and were afterwards entertained. Provost Burnett, in proposing the toast of "The Grampian Electricity Supply Co.," and "Messrs. Balfour, Beattie & Co.," the contractors, wished them success in their undertaking and thanked them for the way in which they had carried out their work. Mr. Johnston and Mr. Leckie responded.

Bedford.—LOANS SANCTIONED.—The Electricity Committee has obtained sanction to loans of £2,000 for street lighting and £2,072 for power station extensions.

MAINS EXTENSIONS.—Mains extensions costing £1,854 are to be carried out.

Birkenhead.—LOANS.—The Electricity Committee has applied for sanction to the borrowing of £15,000 for the assisted wiring scheme, £1,500 for irons, and £20,000 for mains.

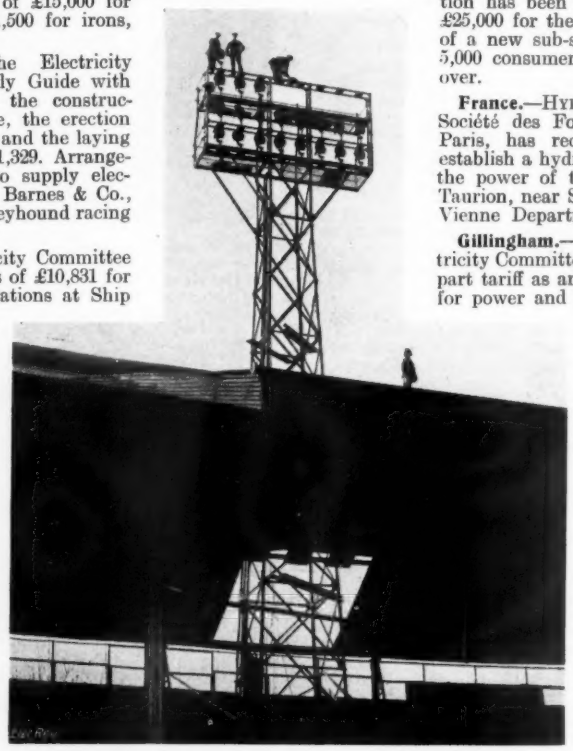
Blackburn.—EXTENSIONS.—The Electricity Committee has agreed to supply Guide with electricity. This will involve the construction of a 6,600-V overhead line, the erection and equipment of a sub-station, and the laying of l.p. mains, at a total cost of £1,329. Arrangements have also been made to supply electricity to the works of Messrs. Barnes & Co., of Whitebirk, and to the new greyhound racing track in Hill Street.

Bolton.—LOANS.—The Electricity Committee is to apply for sanction to loans of £10,831 for providing and equipping sub-stations at Ship Gates, Chorley Street, and the Market Hall, Knowsley Street, and £90,860 for works necessary for connecting the Council's generating station to the transmission lines of the Central Electricity Board.

Bridlington.—CHEAPER POWER.—The following reductions in power charges are to be considered by the Electricity Committee:—From 4d. to 3d. per kWh for 500 kWh a quarter; from 3d. to 2d. for 1,000 kWh; and from 2d. to 1d. for over 1,000 kWh.

Broadfield (Oswaldtwistle).—ELECTRICITY AT LAST.—After waiting five years residents at Broadfield have the option of having electricity in place of gas and oil lamps.

Burnham (Essex).—REQUESTS FOR SUPPLIES.—The Urban District Council has been requested by residents in Mill Road and Stoney Hills to use its influence to obtain electricity for that district. The supply company has intimated that it is not practicable to supply electricity to Stoney Hills owing to certain technical difficulties.



Four towers 110 feet high and carrying thirty-two 1,000-W projector lamps have been erected at the White City Stadium to illuminate the ground for Rugby football by night. "Phili-flood" lamps, fitted with crystal silvered reflectors, are being used

Central Scotland.—THE GRID SCHEME.—The programme of standardisation of frequency and the construction of the grid has now been completed in the Central Scotland area, and as we reported in our last issue, the Central Electricity Board has notified authorised undertakers that as from January 1st next, trading operations in that area will commence under the provision of the 1926 Act. Under the grid scheme, production of electricity in the area will be concentrated in ten selected stations, the chief of which are Dalmarnock, Clydes Mill, Yoker, Portobello, Dundee, Bonnybridge, and Kilmarnock. The ten stations are interconnected by main transmission lines operating at 132,000 V, with extensions on the east and west to link up with the South Scotland Scheme. The length of main transmission lines as completed amounts to 241 miles, and that of secondary lines 12 miles.

China.—NEW POWER STATION.—A new power station with a capacity of 15,000 kW has recently been completed at Sui Chen Chiao, Zahow, Chekiang Province. Excluding the Shanghai Power Co.'s plant, it is the largest generating station in China.

Croydon.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £2,100 in roads from which applications have been received for supplies under the assisted wiring scheme.

Derby.—CHEAPER ELECTRICITY.—The following reductions in electricity charges, representing a concession of £12,000 per annum to consumers, are to be introduced:—Power, first 10,000 kWh a month, 1d. per kWh; next 90,000 kWh, 0.8d.; over 100,000 kWh, 0.75d. Heating and cooking, first 2,000 kWh a quarter, 1d.; over 2,000 kWh, ½d. Outside the borough the charges will be ¼d. per kWh higher, as at present.

Dover.—LOAN FOR MAINS.—The Electricity Committee proposes to apply for sanction to a loan of £2,000 for general mains extension.

Eastbourne.—EXTENSIONS.—The Electricity Committee has obtained sanction to a loan of £10,660 for extensions.

Eccles.—MAINS EXTENSIONS.—The Electricity Committee has obtained sanction to a loan of £8,000 for mains extensions. At the moment it is proposed to spend £540 on new mains.

Finchley.—FRINGE ORDER.—The Electricity Committee is to apply for a Fringe Order to supply electricity to the Sweets Nursery Estate, Friern Barnet Lane, which is about to be developed.

MAINS EXTENSIONS.—Mains extensions are to be carried out in Huntingdon Road and North Circular Road at a cost of £430. Sanction to borrow £18,000 for mains and services has been received.

Fleetwood.—THE CHANGE-OVER.—Good progress is being made with Fleetwood's change-over from d.c. to a.c. Application has been made for sanction to a loan of £25,000 for the cable required, and the erection of a new sub-station has been started. Out of 5,000 consumers 1,000 have now been changed over.

France.—HYDRO-ELECTRIC DEVELOPMENT.—The Société des Forces Motrices de la Vienne, of Paris, has recently secured a concession to establish a hydro-electric power station to utilise the power of the Chauvan Falls on the River Taurion, near Saint-Priest-Taurion in the Haute Vienne Department.

Gillingham.—ALTERNATIVE CHARGE.—The Electricity Committee recommends the following two-part tariff as an alternative to the two flat rates for power and lighting:—A standing charge of 10s. per kW per month over fifteen minutes duration and running charge of 0.62d. per kWh subject to a coal clause.

NEW MAINS.—Larger l.p. mains are to be laid in about nine miles of streets at an estimated cost of £9,750.

Grampians.—PROVISIONAL ORDER.—Application has been made by the Grampian Electricity Supply Co. to the Secretary of State for Scotland for a Provisional Order providing, among other things, for the extension of the period limited for the compulsory purchase of land by the company, the conferring of additional powers upon the company, the limitation of persons to whom the company shall be under obligation to supply, the emendation of the provisions relating to the transfer of undertakings, etc., to the company, and the increase of capital by Special Order.

Great Yarmouth.—MAINS AND SERVICES.—The Electricity Committee has obtained sanction to a loan of £30,000 for mains and services.

Hastings.—EXTENSIONS.—The Electricity Committee is to extend mains in the Northiam and Peasmarsh districts at a cost of £1,384.

Hornsey.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £1,040.

Hull.—STREET LIGHTING IMPROVEMENTS.—The Highways Committee is to provide additional electric lighting on main roads at a cost of £870.

London.—HAMMERSMITH.—The Electricity Committee is to provide supplies of electricity to the United Dairies, Ltd., Wood Lane, at a cost of £2,965, and to the General Motor & Tyre Co., Riverside Wharf, Crisp Road, at a cost of £1,193.

KENSINGTON.—In the House of Commons on December 5th Sir William Davison asked the Minister of Transport if he could state when it was estimated that, as a result of the operation of the grid system, a reduction would be made in the present high prices charged for electricity in the Royal Borough of Kensington. Lieut.-Colonel Headlam, who replied, said that trading operations under the grid system for South-East England had not yet commenced, and it was difficult to forecast by what date it might be anticipated that consumers of electricity in particular areas would benefit from economies in generation effected by that system.

Lytham St. Anne's.—CHRISTMAS LIGHTING.—A campaign is in progress to induce shopkeepers to make special lighting displays in order to attract Christmas visitors and shoppers. A special electricity tariff is to be offered and it is hoped that many of the principal buildings in the town will be floodlighted. The Electricity Department is prepared to lend equipment to local electricians for use in special lighting displays, and decorative illuminations are also to be placed in the squares and principal streets. In the schools children will take part in an essay competition, the subject of which will be "The Best Illuminated Shop Window in the Town."

Maidenhead.—COUNCIL'S ATTITUDE TOWARDS EXTENSIONS.—In reply to a request from the Electricity Commissioners to consider the question of extending the supply to Hurley, the Temple Golf Club and residences in the intermediate districts, the Corporation has replied that it cannot see its way to extend the service into the parish of Hurley, and cannot undertake service outside the present limits of supply while so much of the existing area of supply is undeveloped. It is also pointed out that another electricity undertaking has applied to the Commissioners for power to supply the parishes of White Waltham and Hurley, and that this appears to be a simpler method of meeting the requirements. The Electricity Committee is carrying on negotiations with a view to supplying electricity to Cliveden for Lord Astor.

Maidstone.—OVERHEAD LINES.—The Town Council has applied to the Minister of Transport for permission to use overhead lines to supply electricity to the Loose district.

Manchester.—CABLE EXTENSIONS.—The Rivers Committee is to extend the electric cable from the Davyhulme Works to the sludge steamer loading wharf at a cost of £280.

Maryport.—MAINS EXTENSIONS.—The Mid-Cumberland Electricity Co., Ltd., is beginning work on extending the main overhead line from Stainburn to Maryport.

Morecambe and Heysham.—NEW FEEDER CABLE.—The Electricity Committee is to lay a new feeder cable from Torrisholme sub-station to the depôt in Woodhill Lane, Morecambe, at an estimated cost of £3,200, the necessary switchgear at Woodhill Lane costing £400.

LOAN SANCTIONED.—Sanction to the borrowing of £10,000 for mains and services has been received.

Newhaven.—STREET LIGHTING CONVERSION.—The Lighting Sub-committee has recommended the Urban District Council to accept the offer of the Newhaven and Seaford Electricity Co., Ltd., to convert the whole of the 111 existing gas lamps to electricity.

Northern Ireland.—THE PORTSTEWART UNDERTAKING.—The Urban District Council is considering a proposal from a supply company to take over the municipal electricity undertaking.

Plymouth.—NEW MAINS.—The Electricity Committee is to apply for sanction to the borrowing of £20,000 for new distribution mains.

THE CHANGE-OVER.—The borough electrical engineer has been instructed to proceed at once with the change-over from d.c. to a.c. in the Stoke area. The conversion of the Cumberland Street, Fore Street, and Stonehouse areas, is to be considered later.

STREET LIGHTING.—The Highways Committee is to improve the lighting in Peverell Park Road at an estimated cost of £378.

Plympton St. Mary.—FURTHER POWERS FOR COUNCIL.—The Rural District Council has deposited a Parliamentary Bill for the purpose, among other things, of conferring further powers on the Council with regard to the electricity undertaking.

Ripon.—EXTENSIONS.—Arrangements are being made by the Electricity Committee to supply electricity to Norton Conyers Hall at a cost of approximately £468.

Scarborough.—CHRISTMAS ILLUMINATIONS.—The Town Council has decided on a scheme of special street and sea-front illuminations for Christmas on a much larger scale than last year's experimental attempt. From the middle of December to the middle of January all the main streets, including the Valley Bridge and the St. Nicholas Cliff Gardens, will be strip-lighted. The Town Hall will be illuminated and there also is a scheme in contemplation for floodlighting the South Bay. Shopkeepers are expected to co-operate in the illumination of the shopping streets.

Seaham Harbour.—REPLY TO CRITICISMS.—With regard to the report of the district auditor criticising various expenditures of the Council, Mr. H. F. Lee, chairman of the Finance Committee, recently stated that electric iron and lamps were lent free, not "issued," in order to provide an incentive to the use of more electrical energy, and so far the experiment had proved a success. If, however, it failed to answer its purpose fully the practice would be discontinued. Mr. Lee suggested further that the auditors' report that the net revenue account of the Electricity Department showed a loss on the year was liable to misconstruction. The final result was that without touching the reserve of £2,500 there was a balance of £211 on the net appropriation account.

Sheffield.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £1,817.

Shipley.—LOAN FOR MAINS.—The Electricity Committee is applying for sanction to a loan of £10,000 for new mains.

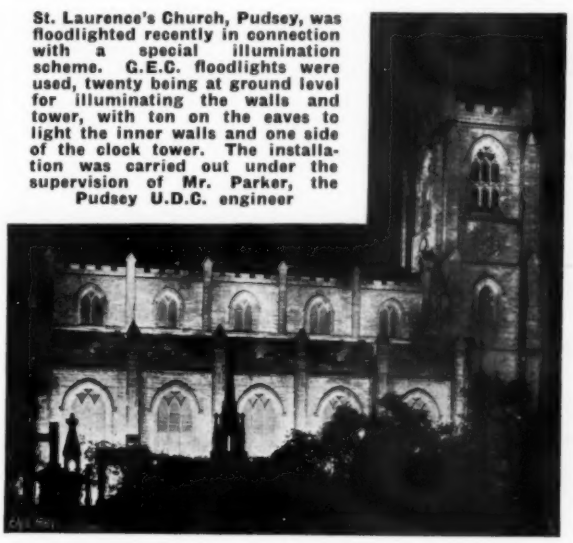
EXTENSIONS TO CRAG END.—Mains extensions costing £1,100 are to be undertaken to supply houses on the Crag End Estate.

Spain.—HYDRO-ELECTRIC PROGRESS.—Work is progressing rapidly on the first portion of the scheme drawn up by the Sociedad Hispano-Portugesa des Transportes Electricos for the utilisation of the water-power resources on the Spanish-Portuguese frontier. The part under construction comprises the building on the River Esla of a dam 295 ft. high and 923 ft. across the sill, this providing a lake with a storage capacity of about 220,000 million gal. of water. The power station has been constructed to house four sets of turbines and generators, each designed to develop 42,500 h.p. under a head of 196 ft. and 75,000 h.p. under 285 ft., when running at 187½ r.p.m. At first only three sets are being installed, these consisting of Francis-type vertical-shaft turbines, built by the J. M. Voith Co., coupled to G.E.C. alternators.

Tipton.—OPPOSITION TO SPECIAL ORDER.—The Urban District Council is now the only one of twenty local authorities which still opposes the application of the Midland Electric Corporation of Power Distribution for a Special Order to extend the latter's period of tenure until 1972. The matter is to be further considered by the Council when additional information is available.

Torquay.—ELECTRICITY FOR WADDETON COURT.—The Electricity Committee proposes to lay an underground cable from Paignton sub-station to give a supply of electricity to Waddeton Court.

Turkey.—A SUPPLY COMPANY'S PROGRESS.—A report of the Société Turque d'Electricité shows that the output of power during 1931 amounted to 84,703,396 kWh, as compared with 74,775,240 kWh in 1930. During the same period the actual sales increased from 61,954,794 to 69,999,199 kWh, and the number of consumers from 61,688 to 73,079. So far this year



St. Laurence's Church, Pudsey, was floodlighted recently in connection with a special illumination scheme. G.E.C. floodlights were used, twenty being at ground level for illuminating the walls and tower, with ten on the eaves to light the inner walls and one side of the clock tower. The installation was carried out under the supervision of Mr. Parker, the Pudsey U.D.C. engineer

there has been a further increase, the sales of power during the nine months ended September last having amounted to 53,187,084 kWh, against 51,861,739 kWh during the similar period of last year. In addition to Stamboul, the company is also now supplying power to several localities on the Asiatic side of the Bosphorous, and to the Black Sea Islands of Buyuk-Ada and Heybell-Ada. A submarine cable has been laid between Stamboul and Scutari as a result of which a large demand is expected to develop in Asia Minor for lighting purposes, and also for the supply of power to the Scutari-Kadikeuy electric tramways.

Warrington.—MAINS AND SERVICES.—The Electricity Committee is to apply for sanction to the borrowing of £22,000 for mains and services.

Wigton (Cumberland).—OVERHEAD LINE DIFFICULTIES.—In reply to a letter from the Rural District Council asking that the electricity scheme for the area should be proceeded with as soon as possible, the Mid-Cumberland Electricity Co., Ltd., states that until the Cumberland County Council withdraws its opposition to the use of overhead lines the scheme will have to be deferred.

Yeovil.—NEW SUPPLY SCHEMES.—The South Somerset and District Electricity Co., Ltd., has informed the Rural District Council that electricity should be available for East Chinnock before Christmas, and that at East and North Coker, and on the housing estate on the Yeovil-West Coker Road, supplies should be available within the next three months.

York.—UNDERGROUND CABLES.—The Electricity Committee recommends the replacement of the existing overhead lines from Earswick to Strensall by an underground cable between New Earswick and Towthorpe, at an estimated cost of £3,865.

OVERHEAD LINE RENEWAL.—The renewal of the overhead line from Fulford pumping station to the Naburn sewage works is to be undertaken at a cost of £400.

Traction

Bradford.—A PENNY ALL THE WAY.—Mr. C. R. Tattam, general manager of the Corporation Tramways, has introduced a scheme for a uniform " penny-all-the-way " fare on the city's trams and trolley-buses during certain off-peak hours on eight days between December 5th and 15th. The days concerned are the Mondays, Tuesdays, Wednesdays and Thursdays, and the hours from 9.30 a.m. to 12 noon and 2.30 to 4.30 p.m. The object of the reduced fares is to encourage Christmas shopping by tram and trolley-bus, but if the experiment is successful it may be a lead to certain important fare developments generally. No reduction is to be made in bus fares.

Brighton.—TRAFFIC SIGNALS.—The Watch Committee recommends the installation of " Electromatic " signals at various crossings at a cost of £4,940.

Italy.—RAILWAY ELECTRIFCATON.—A new electric railway has recently been completed and opened for traffic between Rome, Castellana, and Viterbo. The work of converting the old steam tramway between Monza and Carate Brianza to electric traction has also recently been completed by the Società Trazione Elettrica Lombarda, which is now operating about 48 miles of electric tramways in the province of Milan.

Japan.—RAILWAY EXTENSIONS.—The Atenmi Electric Railway is to be extended from Tawara-machi to Fukuye (10 km.) at a cost of 500,000 yen, and the Ikegami Electric Railway for a distance of about 1 km.

London.—BATTERSEA.—Automatic traffic signals are to be provided at the junction of Battersea Rise, Northcote Street and St. John's Road.

South Shields.—ECONOMY SCHEME.—Mr. J. Austin Baker, Corporation tramway manager, has prepared a scheme of economies for the town's transport services in order to prevent a possible deficit of £5,000 on the undertaking for the year ending March 31st next. Among other things it is proposed to withdraw a certain number of trams and buses from service and to reduce inspectors' and clerks' salaries. Mr. Baker suggests that these economies should be put into operation at once, and that normal conditions should be resumed at the beginning of the next financial year.

Southern Railway.—THE BRIGHTON RAILWAY SIGNALS.—The new 225-lever all-electric signal cabin on the east side of Brighton railway station takes the place of six separate boxes, and controls all trains, both electric and steam, on 119 miles of track. Many miles of point rodding and signal wires will be eliminated, and 115 points will be operated by electric motors. All the new signals will be of the colour-light type. When the installation is completed nearly 200 track miles will be equipped with these signals.

Sweden.—ELECTRIFICATION AHEAD OF SCHEDULE.—Electrification work on the Stockholm-Malmö-Trälleborg main line and certain junction lines has proceeded much more rapidly than was foreseen in the construction plan, and it is expected that the work will be finished by January, 1934, says *Reuter's Trade Service* (Stockholm). Only a small additional allowance of about Kr.9,000,000 will be required to complete the work. The Railway Board has also concluded preliminary contracts for the supply of material and eighty electric locomotives (costing about Kr.29,000,000) for the proposed electrification of the Stockholm-Krylbo-Aange lines (484 km.) and the Krylbo-Oerebro junction line (132 km.). The Board emphasises the fact that electrified lines have everywhere proved better able than steam lines to compete with motor traffic.

United States.—A PNEUMATIC-TYRED DIESEL-ELECTRIC RAILCAR.—A Diesel-electric railcar with pneumatic tyres was put into service recently by the Reading Company. The car can be controlled from either end and has a seating capacity for 47 passengers. The *Electric Traction and Bus Journal* states that special wheels of Budd design to accommodate the Michelin-Goodyear railcar tyre are used, and in case of puncture a solid metal ring inside the shoe supports the tyre and prevents its collapse. It is anticipated that the tyre life under normal operation will be about 20,000 miles. The car has an acceleration of two miles per hour per second and a maximum speed of from 50 to 55 m.p.h. Bendix-Westinghouse brakes are used on four wheels of each truck. Operating costs, not including crew, are about 12 cents per mile.

Communications

Great Britain.—POLICE RADIO-TELEPHONY.—A radio transmitter has been established by the Stockport, Cheshire, police for communicating with patrol cars.

A similar transmitter is being installed at Glasgow, the linking up of the police wireless service in Glasgow with the surrounding districts within a radius of 25 miles forming part of a scheme drawn up by Chief Constable P. J. Sillitoe. Over 300 police telephone call boxes, which will link up practically every police beat in Glasgow with divisional headquarters, are also to be provided throughout the city.

Lanark County Council Police Committee has also under consideration the installation of a radio-telephone set costing £1,500. Chief Constable A. N. Keith and Mr. Raeside Auld, convener of the Committee, recently visited Edinburgh to view a demonstration of radio-telephony, and the Committee is now to ask the Secretary of State for Scotland whether he would approve a grant for such expenditure.

RADIO RELAY EXCHANGES.—The Gillingham Corporation Highways Committee is considering applications for permission to operate radio relay services in the borough.

The Dewsbury Corporation is to permit Hereford Radio Relays, Ltd., to delete almshouse subscribers from its return under which payment is made to the Corporation in view of the fact that these subscribers will be given the service at a specially low rate. It is also recommended that the Corporation shall give the company permission to erect wires across highways not more than three times within a distance of 600 yards of any other wires erected, in lieu of not more than twice, as laid down in the original agreement.

The new signal cabin at Brighton and a section of the relay room

THE NEW EMPIRE RADIO STATION.—In the House of Commons on December 5th Mr. Doran asked the Postmaster-General if he would state under what clause of the charter dated 1927 the British Broadcasting Corporation was establishing the Empire broadcasting station at Daventry; and whether, in view of the fact that listeners in this country would derive little benefit from the Empire short-wave station at Daventry owing to technical reasons, he could arrange with the various Dominions and Colonies, for whose benefit this station was being erected, that they should defray the cost of upkeep between themselves. Sir K. Wood replied that the stations of the British Broadcasting Corporation were constructed and maintained under Clauses 2 and 5 to 7 of their Post Office licence of January 1st, 1927, and the drafts of the licence and charter were laid before Parliament in Command Paper No. 2756 of 1926. The B.B.C. had decided to bear the cost of the Empire broadcasting station until the service had been established, and it considered itself free to reopen the question of contributions from the Dominions and Colonies later. Any other course would have led to considerable delay in proceeding with the construction of the station and in the establishment of a service which, he believed, was generally approved.

Plymouth.—NEW B.B.C. TRANSMITTER.—The new plant which the B.B.C. is installing to enable its local broadcasting station to transmit on a wavelength of 200 metres instead of 288 is expected to be in operation before Christmas. The power will be 500 W and the service area of the station will be extended from five to about eight miles radius.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—January 24th. Post and Telegraph Department. Resistances and reactances. (A. 11596.)*
January 17th. Automatic telephone relay sets. (A. 11618.)*
January 31st. Telephone registers and induction coils. (A. 11619.)*

Bognor Regis.—December 15th. U.D.C. Small electrically driven centrifugal pump for Slindon waterworks. Messrs. J. & C. Hawksley, 34, Old Queen Street, S.W.1 (deposit £2 2s.).

Coventry.—December 16th. Public Health Committee. Electrical installation at the New Infectious Diseases Hospital, Pinley. (November 25th.)

Egypt.—CAIRO.—February 7th. Ministry of the Interior. Power station of about 660-kVA capacity. (A.X. 11599.)*

Epsom.—December 12th. Electricity Department. Kiosk and transformers. (December 2nd.)

Fife.—December 14th. County Council. Various works, including electric lighting installation, at the Strathmiglo housing scheme. Messrs. Walker & Pride, architects, Church Square, St. Andrews (deposit £1 1s.).

Hull.—Telephone Committee. Telephone cable and loading coils. (See this issue.)

Irish Free State.—LIMERICK.—December 15th. County Borough Board of Health. Electric lighting installation at new Tuberculosis Institution. Messrs. Sheahan & Clery, architects, Cecil Chambers, Lower Cecil Street, Limerick.

Leyton.—December 16th. Education Department. Electric lighting installation at Connaught Road School, Leytonstone. (November 25th.)

Lochgelly (Fife).—December 15th. Town Council. Electric lighting for Moor area housing scheme (86 houses). Mr. J. T. Scobie, architect, 1, Douglas Street, Dunfermline (deposit £2 2s.).

Menston (Leeds).—December 19th. Electric lighting installation at Mental Hospital. Mr. R. Maxwell Bond, clerk to the Mental Hospitals Board, Wakefield (deposit £1).

New Zealand.—WELLINGTON.—January 10th. Post and Telegraph Department. 10,000 telephone transmitters. (A.X. 11587.)*
January 23rd. Twenty miles of v.i.r. wire. (A.X. 11609.)*
February 7th. 800 bell receivers and 5,000 mouthpieces. (A.X. 11627.)*
AUCKLAND.—January 16th. Electric Power Board. Negative traction booster. (A.X. 11623.)*

Northern Ireland.—BANGOR (Co. DOWN).—December 12th. Town Council. Electrically driven sewage pumping plant. Messrs. John Taylor & Sons, Caxton House, S.W.1 (deposit £5).

South Africa.—JOHANNESBURG.—December 22nd. City Council. 660- and 6,600-V cables. (A.X. 11607.)*

West Midlands.—December 9th. Joint Electricity Authority. Static step-down transforming plant for the Ocker Hill generating station. (November 11th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Blackburn.—Town Council. Accepted. Three sets of automatic traffic control signals.—Forest City Electric Co.
Electricity Committee. Accepted. E.h.p. switchgear for the connection of the Whitebirk power station to the Central Electricity Board's grid sub-station (£18,259).—A. Reyrolle & Co., Ltd.

Durham.—County Council. Accepted. Electric lighting installations in school.—Barmston (£44).—Devereaux Moodie & Co., Ltd.; Dunston Hill (£289).—Robson & Coleman; Broom Cottages (£215), and High Grange (£63).—W. Sykes & Sons; Dean Bank (£155).—E. D. Barker, Ltd.

Halifax.—Town Council. Accepted. Automatic traffic signals (amended tender, £121).—Forest City Electric Co., Ltd. Electrical work at the new Isolation Hospital (£886).—J. Harrison and Co.

Hastings.—Electricity Committee. Recommended. Switchgear for sub-station at Brede Water pumping station (£729).—English Electric Co., Ltd. Overhead lines and cables at Rye Harbour and Battle (£3,720).—W. T. Glover & Co., Ltd.

Leeds.—Electricity Committee. Accepted. Cables.—W. T. Henley's Telegraph Works Co., Ltd. (£222); Edison Swan Cables, Ltd. (£940); Macintosh Cable Co., Ltd. (£575).

Manchester.—Housing Committee. Recommended. Electrical installation at 484 Council houses.—R. H. Clampnett and Co., Ltd.
Education Committee. Accepted. Electrical alterations at Christ Church School, Hulme, and at Moston Lane School.—J. Collier & Co., Ltd.
Electricity Committee. Accepted. 400 ~ a.c. sub-station switchgear (during a period of twelve months).—Bertram Thomas. Circular-immersion-type water heaters (during the period ending April 30th, 1933).—Geo. Bray & Co., Ltd.; Archibald Low & Sons, Ltd. Self-contained-type water heaters (during the period ending October 31st, 1933).—Archibad Low and Sons, Ltd.; Alan Wright, Ltd.; Electric Fires, Ltd. Sub-station kiosks and switchgear.—Metropolitan-Vickers Electrical Co., Ltd.
Watch Committee. Accepted. Automatic traffic signals.—Forest City Electric Co., Ltd.; Revo Electric Co., Ltd.

Newport (Mon).—Electricity and Tramways Committee. Recommended. Switchgear (£18,000).—General Electric Co., Ltd.

Forthcoming Events

Junior Institution of Engineers.—Friday, December 9th. Royal Society of Arts, Adelphi, W.C. 7.30 p.m. Inaugural meeting. Presidential address by Sir Alexander Gibb.

Institute of Transport.—Monday, December 12th. I.E.E., Victoria Embankment, W.C. 5.30 p.m. "English Main Line Electrification." Mr. F. Lydall.

Institute of the Plastics Industry.—Monday, December 12th. Windsor Castle Hotel, Victoria, S.W. 7.30 p.m. "The Finishing and Inspection of Moulded Goods." Mr. C. R. Baggett.

Electrical Power Engineers' Association (London Technical Group).—Tuesday, December 13th. Junior Institution of Engineers, S.W. 7.15 p.m. "Design and Construction of Reactances." Mr. H. C. Goodman.

Illuminating Engineering Society.—Tuesday, December 13th. Caxton Hall, S.W. Joint meeting of the Society of Glass Technology. 7 p.m. Several contributions on Diffusing (Opal) Glassware.

Diesel Engine Users' Association.—Tuesday, December 13th. Caxton Hall, S.W. 3 p.m. Consideration of the Report of the Committee on Heavy-Oil Engine Working Costs (1931-32).

Institution of Engineers-in-Charge.—Wednesday, December 14th. St. Bride Institute, E.C. 7.30 p.m. "The Design and Operation of a Thermal Electric Storage Plant." Mr. E. M. Ackery.

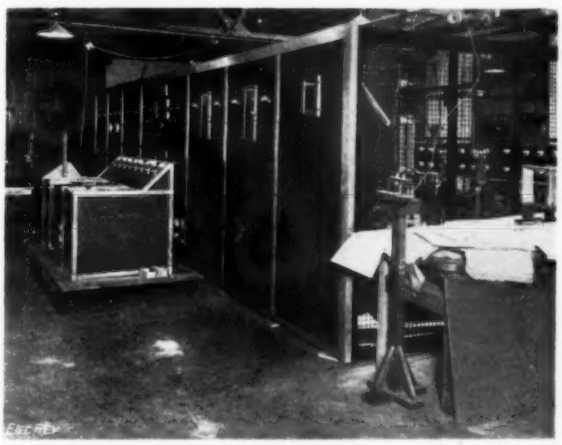
Rugby Engineering Society.—Wednesday, December 14th. Rugby. "The Use of Electricity in the Home." Mr. G. S. Francis.

Batti-Wallah's Society.—Thursday, December 15th. Hotel Metropole, S.W. 12.30 for 12.55 p.m. Luncheon. "Electricity Supply Industry." Mr. W. B. Woodhouse.

Institution of Electrical Engineers.—Thursday, December 15th. Institution, London. 6 p.m. (Joint meeting with Inst. Mech. E. and Institute of Fuel.) "Post-War Developments in High Pressure Boilers." Messrs. C. H. Davy and C. H. Sparks. (*North-Eastern Centre*).—Tuesday, December 12th. Armstrong College, Newcastle-upon-Tyne. 7 p.m. "The Relative Fuel Economy of Electricity, Gas, Oil, and Solid Fuel as Heating Agents." Mr. A. H. Barker. Friday, December 16th, Old Assembly Rooms, Newcastle-upon-Tyne. 7 p.m. Annual dinner and dance. (*North-Western Centre*).—Tuesday, December 13th. Engineers' Club, Manchester. 7 p.m. "The Inland Telegraph Service—the Introduction of Modern Machinery and Methods." Mr. R. P. Smith. (*Scottish Centre*).—Tuesday, December 13th. North British Station Hotel, Edinburgh. 7 p.m. Mr. A. H. Barker's paper. (*North Midland Students' Section*).—Tuesday, December 13th. Hotel Metropole, Leeds. 7.15 p.m. "Damaging Characteristics of Lightning Surges." Mr. H. C. Bowker. (*South Midland Students' Section*).—Tuesday, December 13th. University, Birmingham. 7 p.m. "Switchgear." Dr. C. C. Garrard. (*North-Eastern Students' Section*).—Wednesday, December 14th. 6 p.m. Visit to the Optical Works of Sir Howard Grubb, Parsons & Co. (*Hampshire Sub-Centre*).—Wednesday, December 14th. University College, Southampton. 7.30 p.m. "Coil Ignition Systems." Mr. E. A. Watson. (*London Students' Section*).—Friday, December 16th. Institution, London. 6.15 p.m. Students' lecture. "Switchgear." Dr. C. C. Garrard. Saturday, December 17th. 3 p.m. Visit to Mayfair Automatic Telephone Exchange, W. (*North-Western Students' Section*).—Saturday, December 17th. 2.30 p.m. Visit to Central Fire Station, Manchester.

Birmingham Electric Club.—Friday, December 16th. Grand Hotel, Birmingham. 7 p.m. Annual meeting.

Association of Mining Electrical Engineers (South Wales Branch).—Saturday, December 17th. Visit to School of Mines, Treforest. "Underground Lighting, with special reference to Miners' Hand Lamps." Mr. R. H. Campin. Smoking concert and supper at New Inn, Pontypridd.



A high-power broadcasting transmitter, of a type similar to that to be installed at the new Cape Town station, undergoing final tests at the Marconi works at Chelmsford

Notes

Northampton Polytechnic Extensions

An extensive programme of musical and athletic events, in addition to technical displays, lectures, &c., was arranged by Mr. S. C. Laws, principal, in celebration of the opening of the building extension of the Northampton Polytechnic Institute by H.R.H. Prince George on December 2nd. The opening ceremony was followed by the annual prize distribution. On Saturday evening the annual conversazione took place.

The extension occupies part of a site facing the main building, and has been designed to accommodate laboratories and workshops as well as classrooms. The new building comprises basement, ground floor, and four storeys above; the total floor area is approximately 28,000 sq. ft. Rooms occupied by the chemistry section include laboratories for fuels, electro-deposition, metallurgy and metallography. The rooms are exceedingly well lighted, both as regards daylight and artificial illumination, whilst the workshop equipment has been suitably extended by the addition of modern lathes and other machinery. The case of a synchronous electric clock in the entrance hall as well as the hall electric lighting fittings have been designed by Mr. A. C. Jolley, head of the Electrical Engineering Department. The building, apart from site, furniture, and equipment, has involved an expenditure approximating to £45,000. It is intended to proceed with reorganisation within the main building, the space now set free by the transfer of sections to the extension making possible considerable expansion in other directions, particularly in the provision for instruction in engineering and physics.

The E.A.W.

A new branch of the Electrical Association for Women was inaugurated at Ilkley, Yorkshire, on November 30th, with Miss Lawson as hon. secretary. Mrs. Woodhouse presided, and addresses were given by Lady Fisher Smith, president of the recently formed Yorkshire county organisation of the E.A.W., and Miss C. Haslett. The Ilkley branch is the sixth branch of the Association to be formed in Yorkshire.

The photograph reproduced herewith was taken at a recent meeting of the E.A.W. Council which was held at 20, Lower

Members of the E.A.W. at their new premises at 20, Lower Regent Street, London

Regent Street, S.W.1, the prospective new premises of the Association. Mrs. G. Z. de Ferranti is in the chair, Lady Moir on her right, Miss C. Haslett and Mrs. Ll. B. Atkinson on her left. There will also be seen Mrs. Lamb, Mrs. Garrard, Mrs. Morley New, Mrs. C. C. Paterson and Mr. A. C. Cramb. The office staff will be moving into the new premises on December 23rd, and it is hoped that the official opening will take place early in the new year.

Mining Engineers' Dinner

The "coming of age" dinner of the West of Scotland branch of the Association of Mining Electrical Engineers was held on December 3rd at Glasgow. Mr. A. F. Stevenson presided. Mr. C. Augustus Carlow, president of the Mining Institute of Scotland, replying to the toast of "Our Guests," said that colliery companies ought to have research departments consisting of men set aside for the purpose. Bailie McSkimming, the senior magistrate of Glasgow, proposed the toast of "The Association." He said that Scotland had been particularly prominent in the development of the use of electricity in mines. The first colliery to be lighted by electricity was Earnock, and the electric coalcutter was invented in Scotland. To-day electrical machinery having an aggregate horse power of 1,833,536 was installed in mines in this country, and the percentage of coal electrically cut in Scotland was 60, as compared with 17.5 for the rest of Britain.

He understood, Bailie McSkimming went on, that they could generate electrical power at the pit from the stuff which they could not sell at a price which no electricity board or hydro-electric station, with its large capital costs, could touch. How was it, if that were so, that this great industry had retired to the background while we spent millions of the nation's money to provide cheap electricity?

Mr. F. Beckett, president of the Association, who replied, said that one of the results of the work of the Association had been a decrease in the number of accidents in the mines. At the suggestion of the Chief Electrical Inspector of Mines the Association had arranged demonstrations showing the correct way of repairing damaged trailing cables, and these demonstrations were being given in all the branches of the Association.

I.E.E. (North-Western Centre)

The annual dinner of the North-Western Centre of the Institution of Electrical Engineers will be held on January 17th, at the Midland Hotel, Manchester, at 6.45 for 7.15 p.m., when the president, Prof. E. W. Marchant, will be present. Tickets (10s. 6d. each, exclusive of wines) can be obtained from Mr. J. W. Thomas, hon. secretary, Royal London House, 196, Deansgate, Manchester.

A Novel Demonstration Vehicle

The van illustrated on page 853 has recently been completed by the Nationale Automobil Gesellschaft, Berlin, for the Dr. Oetker Co. for cake-making demonstrations. In the large kitchen compartment are a refrigerator, two electric cake ovens and a three-pan electric boiler, hot water being supplied from a 6½-gallon electric water heater. The rear half of the body is set out as a saleroom, while a cinematograph projector is mounted in the roof. As it was not possible to install a large generating set on the vehicle on account of the fumes, it was decided to mount a special set on a trailer. This trailer, it will be noticed, outwardly takes the form of a large cake and the equipment contained in it comprises an 18-h.p. four-cylinder petrol engine driving through chain gearing a 10-kW, 115-V dynamo, which is used to keep fully charged a 60-cell 96-Ah battery. Altogether the total electrical requirements amount to 12.2 kW. Behind the driver's cab is a compartment equipped with a gramophone, a microphone, and Siemens and Halske amplifying apparatus for enabling messages to the public to be transmitted through a loudspeaker on the roof.

A Parsons Memorial

A memorial in bronze to the late Sir Charles A. Parsons, the inventor of the steam turbine engine and founder of the Turbinia Works, Wallsend-on-Tyne, was unveiled at the works on December 2nd. The unveiling ceremony was performed by Mr. R. J. Walker (managing director of the company), while others present included Lady Parsons, Mrs. Walker, Miss Burns, the Hon. Geoffrey L. Parsons, Sir Eustace H. Tennyson d'Eyncourt, Messrs. Stanley S. Cook, and W. H. Pilmour (directors of the company), F. G. H. Bedford, A. D. C. Parsons, J. Rosen, and C. D. Gibb (directors of Messrs. C. A. Parsons, Ltd.), Engineer-Commander H. R. Baker, R.N., and Mr. Herbert Maryon, of Armstrong College. The memorial is a bronze tablet with a portrait in relief of Sir Charles.

An E.P.E.A. Dinner

The annual dinner of the Electrical Power Engineers' Association (North-Eastern Division) was held at Newcastle last Saturday. Those present included the Mayors of South Shields and Gateshead; Mr. H. A. Couves, general manager of the North-Eastern Electric Supply Co., Ltd., Mr. and Mrs. L. H. Booth, and Mr. J. H. Low, divisional secretary of the E.P.E.A. Mr. J. M. Gibson, chairman of the division, presided. Alderman Ritson (Mayor of Gateshead) proposed "The Electrical Industry," in which, he said, £354,000,000 was invested. The industry consumed 10,000,000 tons of coal annually and the output was increasing each year. The North-Eastern Electricity Supply Co., Ltd., was the largest power-distributing company in the British Isles, covering an area of 5,000 square miles. About 200 collieries in Northumberland and Durham took electricity from its mains.

In replying, Mr. R. P. Sloan, managing director of the North-Eastern Electric Supply Co., remarked that there was still scope for a great deal of development in the industry. Development was essential if the national scheme was to succeed, for the success of that scheme depended on the greater use of electricity. According to the Weir Committee it was estimated that in 1940 the consumption per head would be 500 kWh, while the figure for last year was 203 kWh. If the advance during recent years was not increased substantially they would only reach the consumption figure of 353 kWh per head in 1940, which was 30 per cent. below the estimate. Great efforts would have to be made before the end of that period to increase consumption. At present only one-third of the 11,000,000 homes in Great Britain were wired for electricity. Mr. J. Edgar, borough electrical engineer, South Shields, proposed "The Association," and Mr. H. J. Taylor, president of the E.P.E.A., responded.

Appointment Vacant

Chief assistant for Plymouth city electrical engineer.
(See our advertisement pages to-day.)

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of the makers of the following:—

VELOCETTE vacuum cleaner.
Electric mirror sign.
RELIABLE bell push.
K.E.C. sliding resistances.
KROHMAYER ultra-violet ray lamp.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. T. C. Swallow, who has been appointed advisory engineer in the office of the High Commissioner for the Union of South Africa, has arrived in London. He was mechanical engineer of the Union Government Railways at Uitenhage.

Mr. E. T. Norris, the author of the article on "Voltage Control," which appears on p. 846 of this issue, won a scholarship for a two-years' electrical engineering course at Finsbury Technical College, which was supplemented by the Associateship of Manchester College of Technology. He received his technical training with the British Westinghouse Co., after which he joined Ferranti, Ltd., with whom he was for two years chief assistant transformer designer; he became chief designer in 1922. In this position he has taken part in many of the company's achievements, including the development of high-voltage testing transformers, which led to the production of a million volts for the first time in this country in 1925, and the construction of the first British million-volt laboratory in 1928. He is a member of the I.E.E., and a Fellow of the American Institute of Electrical Engineers, and has read papers before these institutions and the International High-Tension Conference. He is the author of numerous articles which have appeared in English, German, and American technical journals.

[Lafayette

Mr. E. T. Norris

Miss Anna Holm, of the North-Eastern Electric Supply Co., Ltd., is joining the staff of the Electrical Association of Women as chief lecturer in the Electrical Housecraft School.

Mr. R. J. Millard has relinquished his position with the London Fan and Motor Co., Ltd.

Mr. T. A. Rose, of Thomas Rose & Son, Ltd., is to make a special tour early next year. He will sail on January 14th for Africa, and intends to call at all the principal towns.

Mr. John R. Hullah has recently joined the outside sales staff of Messrs. Bruce Peebles & Co., Ltd. Mr. Hullah will operate in the Yorkshire area; his address is 21, Highthorne Avenue, Fagley, Bradford.

Mr. J. H. Williams, a director of the Marconiphone Co., Ltd., has now been appointed managing director.

Mr. T. Stancombe, who has retired from the Electrical Department of H.M. Dockyard at Rosyth, has been presented by his colleagues with a gold hunter watch and a case of pipes. The presentation was made by Mr. G. Howes, the electrical engineer.

[Vandyk

Sir Alexander Gibb, who is delivering his presidential address on "The Future of Water Power in Great Britain" before the Junior Institution of Engineers this (Friday) evening

Ald. R. S. Chatfield, chairman of the Eastbourne Electricity Committee, and **Dr. D. W. A. Roberts,** deputy electrical engineer, have resigned, according to the daily Press. The proceedings at the meeting of the Eastbourne Corporation held on Monday last regarding Ald. Chatfield's resignation are reported in this issue (p. 850).

At the inauguration of the Croydon sodium-lamp lighting scheme (see page 851):—Front row: Dr. A. F. Philips (founder of the Philips concern), Ald. W. Peet (Mayor of Croydon), and Councillor Marshall (chairman Croydon Electricity Committee). Back row: Mr. D. C. F. van Eendenburg (managing director, Philips Lamps, Ltd.), Mr. W. T. E. Blunden (general sales manager), and Sir Robert Donald

Mr. D. Winton Thorpe, A.M.I.E.E., has resigned from the board of Thorpe & Thorpe, Ltd., and is now practising as a consulting electrical engineer. His address for the time being is "Black Firs," Chalfont St. Giles, Bucks.

Mr. James J. Kenny, Controller of Telegraphs, Dublin, who has retired after forty-five years' service in the Telegraph Department, G.P.O., was recently presented by the staff with a wireless set, a bureau and a bookcase.

Mr. John Wilkinson, of the staff of the Whitehaven Corporation Electricity Department, who was married on November 23rd to Miss Mildred Sharples, was presented by his colleagues with an oak chiming clock.

Mr. Desmond Pearson, a West Riding illumination engineer, has been appointed deputy chairman of the Bradford Corporation Electricity Committee.

Mr. T. H. Carr has been awarded the I.E.E. (North-Eastern Centre) Students' prize for his paper on the "Electrical Equipment of Power Stations."

Mr. G. Harper, who, as recorded in our last issue, has been appointed boiler-house superintendent at Croydon

Mr. V. E. Gray, who has just retired from the traffic managership of Overseas Communications of South Africa, Ltd., is due to arrive in England shortly, accompanied by Mrs. Gray.

Obituary

Mr. G. Tough.—The death is announced of Mr. George Tough, O.B.E., M.I.E.E., which occurred at Portobello, Midlothian, on December 3rd. Mr. Tough was apprenticed to Messrs. Hall, Russell & Co., Ltd., engineers and shipbuilders, and in 1897 joined a Leith engineering firm. In 1899 he was appointed mechanical assistant at the Coventry Corporation electricity works, when the station had a capacity of 350 kW. He became engineer and manager in 1908, and upon his retirement in April, 1930, the capacity of the generating plant had risen to 70,000 kW with 21,291 consumers. He was responsible for the plans and the erection of the Longford power station, a scheme which cost £750,000. Upon his retirement he was succeeded by Mr. J. Marston. Mr. Tough, who was a native of Aberdeen, leaves a widow and two daughters. The interment took place at Coventry on Wednesday last.

Mr. W. B. Cownie.—We regret to record the death of Mr. William Brodie Cownie, managing director of the National

Electric Construction Co., Ltd., which occurred on December 4th at his home in Kensington, after a brief illness. Mr. Cownie, who was 59 years of age, was educated at George Watson's College, Edinburgh, and became a qualified chartered accountant five years after leaving school. He commenced his business career in 1895 with a firm of London chartered accountants and joined the National Electric Construction Co., Ltd., as secretary in 1899. He was appointed manager a few months later and eventually joined the board, becoming managing director. He directed his attention to the development of public utility undertakings, the first of which is believed to have been the Musselburgh and District Electric Light and Traction Co., followed by the Torquay and Rhondda Tramways companies. The Devon General Co., now the Devon General Omnibus and Touring Co., Ltd., was purchased later. Other companies of which Mr. Cownie was managing director included the Electrical Finance and Securities Co., Ltd., the Lothians Electrical Power Co., the Mexborough and Swinton Traction Co., the Wisbech Electric Light & Power Co., Ltd., the Colne Valley Electric Supply Co., the Northwood Electric Light and Power Co., the Foots Cray Electricity Supply Co., Ltd., and the Boston and District Electric Supply Co., Ltd. Mr. Cownie was a keen sportsman and in his earlier years played Rugby for Scotland in international matches and for the London Scottish. In later years he was a keen golfer. The funeral took place on Wednesday last at Golders Green Crematorium.

[*Elliott & Fry*

The late Mr. W. B. Cownie

Mr. J. Rippon.—We regret to learn of the death of Mr. Joseph Rippon, O.B.E., of Glenholme, Okehampton, who was formerly well known in the world of submarine telegraphy, both at the Silvertown works and as general manager of the Halifax & Bermudas Cable Co., Ltd., and the Direct West India Cables, Ltd. He passed away at the age of 80 years, on November 19th, at the residence of his niece at Rippon Lodge, Renfrew, Ontario. The funeral ceremony took place at Okehampton Parish Church on Monday last, December 5th. Mr. Rippon's death will be keenly felt by the few remaining associates during his last years of activity in submarine telegraphy work, and on their behalf and our own we wish to express sympathy with his widow.

Mr. G. R. Jamieson.—The death occurred in the Royal Infirmary, Edinburgh, on November 29th at the age of 50, of Mr. George Richardson Jamieson, who was connected with the electrical fittings trade and held responsible positions with leading Glasgow companies.

M. Charles Mourlon.—The death recently occurred in Brussels at the age of 81 years of M. Charles Mourlon, one of the oldest electrical engineers in Belgium and an honorary member of the Société Belges des Electriciens.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

McMichael Radio, Ltd.—Public company. Registered November 28th. Capital, £250,000 in 150,000 8 per cent. cumulative participating preferred ordinary shares of £1 each and 400,000 ordinary shares of 5s. each. Objects: To acquire the radio business of L. McMichael, Ltd., and to adopt agreements with that company, Gubbins & Co., Ltd., H. L. McMichael, R. H. Klein, and B. Hesketh. The directors are: H. L. McMichael, 96, Prince's Park Avenue, N.W.; R. H. Klein, 13, Crediton Hill, N.W.; B. Hesketh, Farnham Royal, Bucks; and Sir Glyn H. West, 18, Park Mansions, Knightsbridge, S.W. Registered office: Dane's Inn House, Strand, W.C.2.

Aluminium Power & Light (Foreign Patents) Co., Ltd.—Private company. Registered December 2nd. Capital, £20,000 in £1 shares. Objects: To acquire from A. G. L. Pennock the benefit of certain inventions relating to improvements in electric cells, and to carry on the business of electrical engineers and contractors, manufacturers and distributors of dry and wet batteries, &c. The subscribers are: H. W. Brown, 63, Effingham Road, Lee, S.E.12, and W. J. Yeoman, 244, Lordship Lane, East Dulwich, S.E.22. Solicitors: Ashurst, Morris, Crisp & Co., 17, Throgmorton Avenue, E.C.

Tote Equipment, Ltd.—Private company. Registered December 2nd. Capital, £200 in £1 shares. Objects: To carry on the business of manufacturers of, agents for, and dealers in apparatus for use in connection with totalisator service, &c. The subscribers are: C. Suckling, 11a, West Hill Avenue, Epsom, Surrey, and J. B. Wilson, 55, Queen's Road, Wimbledon, Surrey. Solicitors: Garton & Co., 21, Maddox Street, W.1.

Jennings (Staple Hill), Ltd.—Private company. Registered December 5th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of, agents for and dealers in radio and electrical appliances, gramophones, &c. The subscribers are: V. E. Davey, 77, Central Park Road, East Ham, E.6, and A. Wilson, 62, Myddelton Square, E.C.1. Solicitors: Zeffertt & Heard, 17, Coleman Street, E.C.2.

Neon-Art Products, Ltd.—Private company. Registered December 3rd. Capital, £100 in £1 shares. Objects: To carry on the business of electricians, mechanical and radio engineers and manufacturers, workers of and dealers in electricity, motive power and light, neon sign, television apparatus, and gramophone manufacturers, &c. The subscribers are: A. W. Bayley, 36, Victoria Street, Westminster, S.W.1, clerk, and C. D. Lowings, 44, Adelaide Road, Brockley, S.E.4. Registered office: 61½, Fore Street, E.C.2.

Tungwire, Ltd.—Private company. Registered December 1st. Capital, £6,000 in £1 shares (4,000 7½ per cent. cumulative preference and 2,000 ordinary). Objects: To carry on the business of manufacturers of and dealers in tungsten, molybdenum, tantalum, and electrical and wireless apparatus, &c. The first directors are: J. Ismay, 108, Westbourne Terrace, W.2, and W. L. T. Arkwright, 8, Francis Street, Victoria, S.W.

Harvey-Thompson Accumulator Service, Ltd.—Private company. Registered November 29th. Capital, £2,000 in 1,000 ordinary shares of £1 and 4,000 10 per cent. cumulative preference shares of 5s. each. Objects: To acquire the business of sellers and dealers in h.t. and l.t. accumulators carried on by C. H. J. Harvey and A. A. Thompson at 246, Coldharbour Lane, Brixton, S.W.9. The directors are: C. H. J. Harvey, 14, Somerleyton Road, Brixton, S.W.9, and three others. Secretary: A. F. Huntly. Registered office: 246, Coldbarbour Lane, Brixton, S.W.9.

Burch & Vertue, Ltd.—Private company. Registered November 26th. Capital £3,000 in £1 shares. Objects: To carry on at Aldershot and elsewhere the business of electrical and general engineers, suppliers and manufacturers of electrical appliances, &c. The first directors are: F. Burch, 1, The Chalets, Upper St. Michaels Road, Aldershot; and E. A. Hills, 13, Edward Street, Aldershot. Registered office: 13, High Street, Aldershot.

Welburn Neon Signs, Ltd.—Private company. Registered November 28th. Capital £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electric, magnetic, animated, illuminated and other signs, signals and devices, &c. The first directors are: L. S. Welburn, 93, Winchester Road, St. Margarets, Twickenham; and P. H. Appleton, 15, Semley Road, Norbury, S.W.16. Registered office: Room 56, British Columbia House, 1 and 3, Regent Street, S.W.1.

Leetome, Ltd.—Private company. Registered November 28th. Capital £1,000 in 96 10 per cent. cumulative preference shares of £10 and 400 ordinary shares of 2s. each. Objects: To carry on the business of manufacturers of and dealers in automatic or other domestic appliances, electrical and mechanical timing devices, &c. The directors are: A. J. Tennison, 80, Little Heath Road, Selsdon, South Croydon; and E. A. Willson, 35, Cedar Road, East Croydon. Registered office: 23, Coleman Street, E.C.

Millbrook Radio, Ltd.—Private company. Registered November 26th. Capital £500 in £1 shares. Objects: To carry on the business of electricians, electric engineers, suppliers and manufacturers of wireless and electrical apparatus, &c. The first directors are: A. A. F. MacLeish, 30, Chepstow Villas, W.11, and two others. Registered office: 160, Mill Lane, West Hampstead, N.W.6.

Returns of Electrical Companies

Eastern Telegraph Co., Ltd.—Capital, £7,000,000 in £5,000,000 ordinary stock and £2,000,000 preference stock. Return dated August 3rd, 1932. All stock issued and fully paid up in cash. Mortgages and charges £2,000,000.

Chloride Electrical Storage Co., Ltd.—Capital, £1,250,000 in 62,000 preference, 791,100 "A" ordinary, 250,814 "B" ordinary, and 146,086 unissued shares of £1 each. Return dated June 10th, 1932. All the preference and "A" and "B" ordinary shares taken up. £180,411 paid on £48,750 preference, 92,913 "A" ordinary, and 38,748 "B" ordinary shares. £923,503 considered as paid on the remainder. Mortgages and charges, nil.

J. Stone & Co., Ltd.—Capital, £1,200,400 in 600,000 preference and 600,400 ordinary shares of £1 each. Return dated July 29th, 1932. All shares taken up. £1,200,400 considered as paid. Mortgages and charges, nil.

Premier Accumulator Co. (1921), Ltd.—Capital, £40,000 in £1 shares. Return dated June 21st, 1932. All shares taken up. £18,749 paid (being £1 per share on 11,249 and 15s. per share on 10,000 shares). £18,757 considered as paid on 18,757 shares. Mortgages and charges, nil.

Standard Radio Relay Services, Ltd.—Debenture dated November 15th, to secure £30,000, charged on the company's undertaking and property, present and future, including uncalled capital, but excluding £13,980 fully paid shares in Broadcast Relay Service, Ltd. Holders: C. Hoare & Co., 37, Fleet Street, E.C.4. Particulars also filed of £50,000 debentures authorised November 15th, 1932, and covered by trust deed of same date, the whole amount being now issued. Property charged: the company's undertaking and property, present and future, including uncalled capital, being a first charge as regards 13,980 fully paid £1 shares of Broadcast Relay Service, Ltd., and subject as regards the remainder of the property charged to above debenture. Trustees: Hoare Trustees.

Joseph Boyce, Ltd.—Particulars filed on November 23rd of debentures not exceeding £300, authorised June 15th, 1932, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £250.

Acton Battery Co., Ltd.—Particulars filed of debentures not exceeding £5,000 authorised November 25th, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £2,600.

Eastern Electric Installation Co., Ltd.—Issue on October 13th of £200 debentures, part of a series already registered.

West Devon Electric Supply Co., Ltd.—The nominal capital has been increased by the addition of £30,000 in £1 ordinary shares beyond the registered capital of £180,000 for the purpose of purchasing the issued shares of the West Devon Mining & Power Co., Ltd., and the Holsworthy Electric Supply Co., Ltd.

Dalgetty Electric, Ltd.—Capital, £500 in £1 shares. Return dated June 15th, 1932. 150 shares taken up. £150 considered as paid. Mortgages and charges, nil.

County Electrical Co. (Pendleton), Ltd.—Capital, £2,000 in £1 shares. Return dated July 6th (filed September 20th), 1932. 1,000 shares taken up. £1,000 paid. Mortgages and charges, nil.

Charles H. Champion & Co., Ltd.—Debenture dated October 27th, 1932, to secure £20,000, charged on the company's undertaking and property, including uncalled capital. Holders: J. H. C. E. Howeson, Halcot, Bexley, and A. Barrie, 55/61, Moorgate, E.C.2.

Voltron Co., Ltd.—F. T. Smith, 150, Southampton Row, W.C.1, ceased to act as receiver and manager on November 28th.

British Battery Co., Ltd.—Satisfaction in full (1) on November 4th, of debenture dated August 21st, 1931, and registered August 27th, 1931, securing £300, and (2) on November 7th, 1932, of debenture dated November 28th, 1929, and registered November 29th, 1929, securing £300.

"New Era" Time & Telephone Systems, Ltd.—Two mortgages, both dated November 11th, to secure £1,000 and £62 10s. respectively. Property charged: Rent and sums due under certain contracts for the purchase or hire of telephone installations, and the company's property and estate therein. Holder: New Era Installation Trust, Ltd., 30, St. Ann Street, Manchester.

City Notes

Crompton Parkinson, Ltd., have called an extraordinary general meeting for December 22nd to consider resolutions for increasing the capital by the creation of a further 173,231 6 per cent. cumulative second preference shares of £1 each and for making certain alterations in the company's articles of association. The proposed additional capital is required mainly for the purpose of financing the company's lamp business, which is stated to be expanding rapidly, and other recent acquisitions. In suggesting that the existing second preference shareholders should agree to the new shares ranking *pari passu* with the present issue of shares, the directors have taken into consideration the fact that since those shares were converted into their present form on the occasion of the amalgamation between Crompton & Co., Ltd., and F. & A. Parkinson, Ltd., their position has been immensely strengthened not only by the large increase in the earning capacity of the company, but by the putting into the company in cash of a large amount of ordinary capital, amounting in the total, including premiums, to the sum of £247,002 10s., and the redemption of the debentures which were previously outstanding. As some consideration to the second preference shareholders, the directors have made it a term of the proposal that the new shares should be offered to them in the first instance with renunciation rights in proportion to their holdings at 22s. per share, which is below the present market quotation. The proposed increase of capital will bring up the amount of the second preference share capital to £500,000. A statement of the profits of the company for the last three financial periods, including an approximate estimate of profits subject to the completion of the audit for the year to September 30th last, shows an annual average over twelve months of £92,272. Adding to this, on an estimate of 5 per cent. to be earned on the new capital, £9,528, the total available is £101,800. The dividend on the first preference shares, gross, requires £13,658 per annum, leaving £88,142. The dividend requirements, gross, for the second preference shares (including the new issue) will be £30,000, which on the above basis of profits would be covered approximately three times. In the event of the proposals being approved, the new shares will be offered immediately after the meeting, and will be issued to carry dividend from October 1st last.

The Swedish Ericsson Co.—It is reported in the financial papers from Stockholm that summonses were issued on November 30th against the old board of directors of the L. M. Ericsson Telephone Co., Stockholm, in respect of the new issue of capital made in 1930. It is said that the board on December 1st, 1930, described the shares as fully paid in cash, whereas the Kreuger investigations are alleged to have revealed that a large portion was made up of bookkeeping entries between Ericsson & Kreuger and Toll. In a letter to the *Financial News*, Mr. J. H. Reed, secretary of Ericsson Telephones, Ltd., London, states that his company is not involved in any way in the transaction referred to, and reminds the shareholders of the following remarks made by the chairman at the last general meeting:—"I must refer now to Mr. Ivar Kreuger's death. I think I should explain that since the incorporation of your company the L. M. Ericsson Telephone Co. has owned the majority of its ordinary shares. About two years ago Kreuger & Toll acquired a controlling interest in the L. M. Ericsson Co., and that is the full extent of your company's relationship with the firm Kreuger & Toll."

The L. M. Ericsson Co. issued Kr. 40,333,000, increasing the capital to Kr. 100,831,300. It was rumoured in May, 1930, that at least one-half of the new issue would be absorbed by Kreuger & Toll.

McMichael Radio, Ltd., whose registration is recorded on another page, made an issue at par last Tuesday of 150,000 participating preferred ordinary shares of £1 each and 150,000 ordinary shares of 5s. each. The former class is entitled to a fixed cumulative preferential dividend of 8 per cent. and to participate to the extent of 40 per cent. in any surplus remaining after the ordinary shares have received 8 per cent., the balance being distributed to the holders of the ordinary shares. According to the prospectus the profits for the past three years have been £28,670, £22,915 and £25,539. It is estimated that the availability of the new capital will treble the sales and produce a net profit of not less than £62,000 per annum. The sum available for working expenses from the issue, after the acquisition of L. McMichael (Holdings), Ltd. (formerly L. McMichael, Ltd.), defraying the cost of new building and equipment (£13,000), and preliminary expenses, is expected to be £63,800 (subject to costs of transfer and brokerage).

The Ceara Tramway, Light & Power Co. reports a net revenue for the year ended June 30th of £9,807, to which is added £9,543 brought in, making £19,350. After deducting debenture interest and sinking fund payment and placing £5,000 to reserve a balance of £4,010 is carried forward. The report states that owing to exchange restrictions the company is unable to continue punctual fulfilment of its debenture stock obligations, and a proposal for obtaining the necessary respite from debenture interest payments for a period is to be submitted to stockholders at a meeting to be held to-day (Friday).

Callender's Share & Investment Trust, Ltd., reports a net profit for the year ended August 31st last of £35,235, as compared with £36,414 in the preceding year. It is proposed to pay a final dividend of 15 per cent., making 20 per cent. for the year, and to place £500 to reserve. The amount carried forward is increased by £9,925 to £64,226.

Tube Investments, Ltd., reports a profit of £201,853 for the year ended October 31st, as compared with £239,422 in the preceding year, to which is added £74,997 brought in. The ordinary dividend is maintained at 8 per cent., and £30,000 is again absorbed for the liaison dividend. The amount carried forward is £82,806.

Stewarts & Lloyds of South Africa, Ltd., have announced a dividend at the rate of 6 per cent. per annum on the first cumulative preference shares for the half-year to December 31st.

Aron Electricity Meter, Ltd., report that the turnover for the first eight months of the current year is more than double that of the corresponding period of last year, and the sales are still showing a certain upward tendency.

The Brazilian Traction, Light & Power Co. has declared a quarterly dividend of 1½ per cent. on the preference shares.

Marco Refrigerators (1929), Ltd., reports a net profit for the year ended September 30th last of £841, reducing the debit brought in to £11,475.

The Ruston-Lister Group.—It is announced that Mr. E. Barford, in conjunction with the Ruston & Hornsby group of companies and Messrs. R. A. Lister & Co., Ltd., has arranged the purchase of the business of Messrs. Barford & Perkins, Ltd., and Aveling & Porter, Ltd. A new company will be formed, of which Mr. Barford will be chairman and managing director.

Stocks and Shares

TUESDAY EVENING.

THE Anglo-American developments, in connection with the repayment of the instalment due by this country to the United States on Thursday in next week, have been once more an outstanding influence over Stock Exchange prices and business. The daily fluctuations in quotations have been affected by news and rumours, as well as by the opinions of people more or less well-informed in regard to the prospect of the payment being insisted upon by America. In New York, it is recognised clearly enough that such payment will be definitely maleficent to the Americans. But it is not New York that has the determining voice in the matter. Against the judgment of bankers and others there is arrayed the ignorance, natural enough, of the great mass of American voters outside the cities. These voters cannot, again naturally enough, see the reason why payment of debts due to their country should unfavourably affect their personal as well as the national interests.

To-day's Financial Problem

Gilt-edged stocks, amongst which may be numbered, of course, the ordinary shares of the London electricity supply companies, have been disposed to caution by reason of the uncertainties connected with the matters mentioned above. There is very little, if any, selling on behalf of the genuine investor, and this accounts for the steadiness shown by the list of prices in the London companies.

Not only in London, but throughout the country, the pressing financial problem, and one which threatens to become still more difficult to solve, is concerned with the prospect for gilt-

edged stocks, in view of the high level of prices that these have attained, and the likelihood of a swing of the pendulum in the other direction during the course of the next few years. People are undoubtedly exercised in their minds as to whether gilt-edged stocks should not be sold, and the money reinvested into the ordinary shares of such undertakings as are likely to benefit from trade revival when it comes. In all of this, there is, of course, nothing new, but, as already observed, the problem becomes cumulatively apparent. In travels round this country, and from face-to-face conversation with those interested in money matters, it will be found that men are extremely puzzled to know what they ought to do at the present juncture, especially in the way of finding suitable employment for money upon which the investor expects to get 5 to 6 per cent. with a fair measure of security.

Electric Supply Corporations have risen to 55s. on the offer of new shares, at 51s. 6d., made to proprietors of the existing ordinary shares. Notting Hill preference strengthened to 12¾. County of London ordinary are a little easier at 2½, and in the foreign group Whitehall Electric Investment preference at 17s. show a small fall. Tokyo Electric sixes have improved to 65, after being a point or two lower.

Home Railways

The Home Railway market is indulging in estimates as to what the dividends are likely to prove in respect of the six months that end with next New Year's Eve. The dividends on the Underground Railway Companies' stocks stand, of course, in a class by themselves, in view of the fact that the stocks may become changed next year into securities of the London Passenger Transport Authority. The Underground Electric is expected to pay 5 per cent. for the year, as against 7 per cent. for 1931. The District Railway will probably pay something less than the 4½ per cent. distributed for the latter year. The price of Underground Electrics has receded to 18s. There is little going on in the shares of the tramway companies; the market as a whole can only be described as uninteresting.

Dollar Stocks

Half an hour's visit to the Montreal Stock Exchange will give a better idea than the writing of columns in this paper can do of the conditions under which Canadian Stock Exchanges are at present working. Although in that particular half-hour the all-pervading depression may chance to be particularly pronounced, the general state of affairs can be easily perceived by those who are accustomed to estimate from observation the amount of business that is taking place. Canada is suffering quite as acutely as the United States from what they all call "The Depression." The listless manner in which members of the Montreal Stock Exchange move about their modest hall is indicative in itself of the quietude of trade. Prices of stocks and shares are put up in correspondence with the tendency shown by New York, but the actual investment attention paid to Canadian utility companies is evidently very meagre, the reason being the fact that people have neither the money nor the spirit to embark upon speculative investment.

At Niagara, one has visible evidence of the vast works, some of which are still under construction, harnessed to the Falls. The frozen character of the ground upon which the spray falls and turns to ice appears to be no harder than the difficulties now experienced in obtaining public capital for the development, under existing financial conditions, of electrical enterprises that derive their power from the Falls themselves.

Electrical and Manufacturing Shares

The tendency in this department has been a little easier. British Insulated drooped to 65s. British Aluminium and Siemens gave way to the common price of 24s. 6d. English Electric ordinary have weakened to 9s. 6d. by reason of the directors' decision to postpone consideration of the preference dividend payment until the year's figures are made up next spring. The preference are unchanged at 14s. Ever Readys show a slight dullness at 27s. 6d. Crompton Parkinsons at 22s. have gained 9d. It is said in the market that the principal cable manufacturing and equipment companies are doing a little less well than they did a year ago, and that when the next reports appear these are likely to show a falling off of business, unless there should be, of course, a distinct revival between the present time and that when the year's figures are published. The shares are popular amongst investors who are on the look-out for sound industrials, and are prepared to put away such purchases for the time being, confident of an improvement in trade taking place before very many months elapse.

Cables and Wireless

Speculation in Cables & Wireless stocks is somewhat quiet. The recent buyers appear to be contented with what they have so far purchased, and, on the other hand, prices are not sufficiently high to warrant any concerted bear attack. American Telephone & Telegraph at 160 are 2½ points lower. Internationals are 13. Oriental Telephones at 58s. 9d. have lost the improvement which they secured a week ago. Great Northern Telegraphs gave way 10s. to 27½. Marconi Marines went back to 32s. 6d.

In the iron and steel group, Babcock & Wilcox firmed up to 38s. 3d. Public interest in this market is waiting upon the course of trade. There is nothing doing in rubber shares.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1930.	1931.	Price, Dec. 6.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	70/-	—	4 5 9
Brompton Ordinary	1	8½	8½	33/-	—	4 4 10
Central Electricity 4½% Deb.	Stock	4½	4½	105	+½	4 5 9
Charing Cross Ordinary	1	8¼	8¼	33/6	—	4 3 7
Chelsea	1	8⅛	8⅛	33/6	—	4 3 7
City of London	1	10	10	45/6	—	4 7 11
Clyde Valley	1	8	7	32/-	—	4 7 9
County of London	1	11	10½	50/-	—6d.	4 4 0
Edmundsons' 7% Pref.	1	7	7	30/-	—	4 13 4
Elec. Dis. Yorkshire	1	9	9	41/3	—	4 7 4
Elec. Supply Corporation	1	11	11	55/-	+1/6	4 0 0
Kensington Ordinary	1	8	8	33/6	—	4 3 7
Lancs. Light and Power	1	6½	7	29/3	—	4 15 9
London & Home Counties 4½% Deb.	Stock	4½	4½	107	—	4 4 0
London Electric	1	9	9	33/6	—	4 3 .0
Metropolitan	1	10	10	46/-	—	4 7 0
Midland Counties	1	7	7	3 /6	+9d.	4 1 2
Mid. Elec. Power	1	8	8	35/9	—	4 9 5
North Eastern Electric Ordinary	1	6	6	26/6	—	4 10 7
Do. 7% Pref.	1	7	7	31/-	—6d.	4 10 4
Northampton	1	10	10	48/-	—	4 3 4
Notting Hill 6% Pref.	10	6	6	12¾	+¼	4 11 0
North Met. Elec. 6% Pref.	1	6	6	29/-	—6d.	4 2 9
St. James' and Pall Mall	1	8	8	33/6	—	4 3 7
Scottish Power	1	8	8	33/9	—	4 14 10
South London	1	8½	8½	33/-	—	4 4 10
Urban Ordinary	1	7	7	33/9	—	4 3 3
Westminster Ordinary	1	8½	8½	33/-	—	4 4 10
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	17/-	—6d.	8 16 0
Yorkshire Elec.	1	8	8	39/-	—	4 2 0
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	82½	—	4 17 0
Metropolitan	„	3½	2½	63	—	5 19 4
Do. District	„	5	4½	67½	—	6 13 4
Underground Electric	1	8	7	18/-	—1/-	7 15 7
TELEGRAPH AND TELEPHONES.						
American Tel. & Tel.	$100	9	9	160	—2½	5 12 6
Anglo-Am. Tel. Pref.	Stock	6	6	105½	—	5 13 9
Do. Def.	„	1½	1½	26	—	5 15 5
Cables & Wireless 5½% Pref.	„	5½	2¾	78½	—	3 10 1
Do. A 7½% Ord.	„	—	Nil	28½	—½	—
Do. B Ord.	„	—	Nil	12½	—½	—
Globe Tel. and T. Ord.	10	8½	Nil	11½	—	—
Do. do. Pref.	10	6	6	11½	—½	5 7 7
Great Northern Tel.	10	20	20	27½	—½	7 5 6
Marconi-Marine	1	15	10	32/6	—⅛	6 3 1
Oriental Telephone Ord.	1	12	12	2 13/16	—⅛	*4 1 8
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	—	—	5/-	—	—
Do. do. 2nd Pref.	5	—	—	3/9	—	—
Do. do. 5% Deb.	Stock	—	—	7	—	—
British Electric Traction Def. Ord.	„	5	5	275	—25	—
Do. do. Pref. Ord.	„	8	8	132½	—	6 0 9
Brazil Traction	100	—	—	12	—1	—
Brit. Columbia Elec. Rly. Pfd.	Stock	5	5	101½	—	4 18 6
London & Sub. Trac. 5% Pref.	1	Nil	Nil	12/-	—	—
London United Tram Deb.	Stock	4	4	67½	—	5 19 5
Mexico Trams, 5% Bonds	—	5	5	45	—	11 2 2
Mexican Light Common	100	Nil	Nil	10	—	—
Do. 7% Pref.	100	7	7	15	—	—
Do. 1st Bonds	—	5	5	72½	+3	6 18 0
Victoria Falls Ord.	1	15	15	77/6	+6d.	3 17 4
Yorkshire (West Riding)	1	Nil	Nil	5/-	—	—
MANUFACTURING COMPANIES.						
Assoc. Elec. Ord.	1	6	4	17/6	—	4 11 5
Do. Pref.	1	8	8	30/-	—	5 6 8
Babcock & Wilcox	1	14	14	38/3	+9d.	—
British Aluminium Ord.	1	10	5	2·/3	—6d.	4 1 8
British Insulated Ord.	1	15	15	65/-	—⅛	4 12 4
Brush Ord.	Stock	5	Nil	40	—	—
Callender's	1	15	15	3 1/16	—	4 18 0
Do. 6½% Pref.	1	6½	6½	28/9	—	4 10 6
Crompton Parkinson Ord.	5/-	30	24	22/-	+9d.	5 9 0
Do. 8% Pref.	1	8	8	30/-	—	5 6 8
Edison-Swan 1st Pref.	1	7½	7½	24/3	—	6 3 8
Do. 5% Deb.	Stock	5	5	100	—	5 0 0
Electric Construction	1	Nil	Nil	8/9	—	—
Enfield Cable Ord.	1	25	25	4 1/16	—	5 12 7
English Electric	1	Nil	Nil	9/6	—6d.	—
Do. do. Pref.	1	Nil	Nil	14/-	—	—
Ever Ready	5/-	35	35	27/-xd.	—6d.	6 7 5
Ferranti Pref.	1	7	7	23/6	—	5 19 2
G.E.C. Pref.	1	6½	6½	29/-xd.	—	4 9 8
Do. ord.	1	10	8	40/-	—	4 0 0
Henley's	1	30	30	6 1/16	—	4 19 0
Do. 4½ Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber	1	Nil	Nil	3/9	—	—
Johnson & Phillips	1	10	5	1	—	5 0 0
Siemens Ord.	1	7½	7½	21/6	—⅛	6 2 5
Telegraph Construction	12	Nil	Nil	10½	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1931

13642. "Metal-vapour electric discharge apparatus." F. Lutz. May 8th, 1930. (383289.)

14174. "Electric heaters." British Thomson-Houston Co., Ltd. May 15th, 1930. (383292.)

14639. "Submersible electric motors." Pulsometer Engineering Co., Ltd., and J. Bjornstad. May 18th, 1931. (383294.)

15290. "Electric fire-alarm apparatus." R. M. Bloch. February 5th, 1932. (383296.)

16238. "Electrical storage batteries." L. Fuller, G. J. A. Fuller, and E. W. Sudlow. June 4th, 1931. (Cognate application 3400/32.) (383297.)

16331. "Methods of eliminating radio interference caused by electric high-tension lines." Hermsdorf-Schomberg-Isolatoren Ges. June 5th, 1930. (383298.)

16583. "Thermal overload-release mechanism for protecting electric motors." International General Electric Co., Inc. June 6th, 1930. (383299.)

19689. "Electric motor control systems." International General Electric Co., Inc. July 9th, 1930. (383304.)

21948. "Electrically heated boilers." G. Mascarini. July 31st, 1931. (383285.)

21953. "Electrical oscillation generators incorporating glow-discharge tubes." Siemens & Halske Akt.-Ges. July 31st, 1930. (383286.)

22008. "Protective arrangements for electric power-transmission systems." R. O. Kapp, C. G. Carrothers, and General Electric Co., Ltd. August 1st, 1931. (383308.)

22405. "Automatic telephone systems." Siemens Bros., & Co., Ltd., and W. G. Patterson. August 7th, 1931. (383314.)

22712. "Radio alarm systems." Submarine Signal Co. December 5th, 1930. (383320.)

23407. "Electromagnetic devices for use in weak magnetic fields." Allgemeine Elektricitäts-Ges. August 19th, 1930. (Addition to 363697.) (383328.)

23413. "Method and apparatus for the taking of X-ray photographs." R. A. Gardner. August 19th, 1931. (383329.)

24254. "Electrical regulators and like control apparatus." Electrical Apparatus Co., Ltd., and R. H. Barbour. August 28th, 1931. (383335.)

24467. "Dynamo-electric machinery." Allgemeine Elektricitäts-Ges. August 29th, 1930. (383339.)

25120. "Electric lamps." Zaidan-Hojin Aoyagi Kenkyusho. September 22nd, 1930. (383342.)

25288. "Electric prepayment meters." Soc. des Compteurs de Genève. September 18th, 1930. (383343.)

25289. "Electric prepayment meters." Soc. des Compteurs de Genève. August 14th, 1931. (Addition to 383343.) (383344.)

25422. "Single-phase induction motors." B. Schwarz. September 10th, 1931. (383345.)

25633. "Carbon microphone." Siemens Bros. & Co., Ltd., and E. R. Wigan. September 12th, 1931. (383348.)

26201. "Method and apparatus for wireless tuning circuits." L. E. T. Branch. September 18th, 1931. (383352.)

26686. "X-ray devices." British Thomson-Houston Co. September 24th, 1930. (383356.)

27004. "Electric incandescent lamps." British Thomson-Houston Co. September 29th, 1930. (383360.)

27819. "Terminal and connecting devices especially adapted for electric heaters." Electric Heating & Hardware, Ltd., and F. J. Wineberg. October 7th, 1931. (383368.)

27976. "Dynamo-electric machines." Allgemeine Elektricitäts-Ges. October 8th, 1930. (383371.)

28298. "Casings or containers for electric machines, switchgear, and like apparatus." Electrical Apparatus Co., Ltd., R. H. Barbour, and J. R. Walton. October 12th, 1931. (383374.)

28370. "Telephonic receivers or speakers of the moving-coil type." F. W. Lanchester. October 13th, 1931. (383376.)

29987. "Alternating current motors." Akt.-Ges. für Schaltapparate. November 5th, 1930. (383393.)

31009. "Electrical relays." C. G. Thorne and Dangar Gedye & Co., Ltd. November 9th, 1931. (383405.)

31257. "Radio and other high-frequency signalling systems." Marconi's Wireless Telegraph Co., Ltd. (W. Albersheim). November 11th, 1931. (383412.)

32272. "Multi-phase condensers." Siemens-Schuckertwerke Akt.-Ges. December 30th, 1930. (383424.)

32554. "Telephone systems." General Electric Co., Ltd., and E. P. Fairbairn. November 24th, 1931. (383428.)

32718. "Polyphase current distribution circuits for mercury-vapour rectifiers." Siemens-Schuckertwerke Akt.-Ges. January 15th, 1931. (383431.)

32832. "Electronic amplifiers, oscillation generators, and frequency multipliers." Marconi's Wireless Telegraph Co., Ltd. December 26th, 1930. (383433.)

33019. "Means for locating faults in electric conductors." W. T. Henley's Telegraph Works Co., Ltd., and J. H. Savage. November 28th, 1931. (383439.)

34006. "Protective tubular casings for electric cables or wires." Meyer-Keller et Cie Akt.-Ges. December 8th, 1930. (383444.)

35159. "Electrically heated domestic irons." T. Price & Son (Stampers), Ltd., and E. E. Price. December 19th, 1931. (383457.)

35804. "Radio receiving apparatus." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. January 10th, 1931. (383461.)

1932

2282. "Method of measuring the thickness of bodies with the aid of X-rays." C. H. J. Müller Akt.-Ges. February 6th, 1931. (383478.)

2564. "Permanent magnets." English Steel Corporation, C. L. Oliver, and J. C. Swan. January 28th, 1932. (383480.)

4750. "Thermionic valves or electron discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 27th, 1931. (383491.)

6590. "Thermionic valves or electron-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 26th, 1931. (383502.)

6754. "Ultra short wave auxiliary fitting for wireless reception." M. von Ardenne. March 16th, 1931. (383503.)

6911. "Production of ultra short waves radiation, suitable for medical and other purposes." E. E. W. Kassner. March 9th, 1931. (383508.)

7084. "Bushing caps for electric cable and insulators." International General Electric Co., Inc. March 10th, 1931. (383509.)

9023. "Electric control circuits." British Thomson-Houston Co., Ltd. March 30th, 1931. (383520.)

9185. "Electric couplings or adaptors." P. Hochkopper, O. Winkel, and E. Assmann. August 21st, 1931. (383522.)

9294. "Electric transformers." International General Electric Co., Inc. April 1st, 1931. (383523.)

9392. "Screening devices for radio and like apparatus." Ideal Werke Akt.-Ges. für Drahtlose Telephonie. December 21st, 1931. (383524.)

9394. "Electric switches." Ideal Werke Akt.-Ges. für Drahtlose Telephonie. December 19th, 1931. (383525.)

9440. "Multi-motor electric drives for printing-presses and the like." International General Electric Co., Inc. April 1st, 1931. (383526.)

9662. "Radio-frequency distribution systems." Marconi's Wireless Telegraph Co., Ltd. April 4th, 1931. (383528.)

9670. "Electrical storage batteries." L. Fuller, G. J. A. Fuller, and E. W. Sudlow. June 4th, 1931. (Cognate application 9671/32.) (Divided application on 383297.) (383529.)

9979. "Electric discharge lamp, especially adapted for advertising and signalling purposes." S. Dobrusskin. December 18th, 1931. (383530.)

10165. "Electrical storage batteries." L. Fuller, G. J. A. Fuller, and E. W. Sudlow. April 8th, 1932. (383535.)

10234. "Contacts for electric rotary installation switches." Siemens-Schuckertwerke Akt.-Ges. April 10th, 1931. (383537.)

11469. "Push-pull circuits for amplifying electric oscillations." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 5th, 1931. (383545.)

11518. "Electrical oscillation generators." Marconi's Wireless Telegraph Co., Ltd. May 27th, 1931. (383546.)

12007. "Methods of and apparatus for electrically removing entrained particles from gas streams." Lodge-Cottrell, Ltd. (Research Corporation of New York.) April 26th, 1932. (383547.)

13060. "Electric lamps particularly for vehicles." R. Bosch, Akt.-Ges. May 15th, 1931. (383553.)

14579. "Electric motors or other apparatus mounted inside a submersible bell or the like." Sulzer Freres Soc. Anon. May 23rd, 1931. (383566.)

16003. "Illumination for aerodromes, especially emergency landing-places." M. Seydel. June 6th, 1932. (383571.)

17213. "Liquid-break electric switches." International General Electric Co., Inc. June 17th, 1931. (383576.)

17512. "Electrical lighting set for cycles." C. Langbein. July 13th, 1931. (383578.)

17640. "Electric discharge tubes." General Electric Co., Ltd. September 8th, 1931. (383580.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from November 30th:—

Atomite. No. 529605. Class 1. Electrolytes for electric batteries and accumulators.—W. K. Petrie, trading as Johnson & Adam, 20, Murraygate, Dundee.

Rockite. No. 534240. Class 1. Synthetic resins in liquid or powdered form, being a chemical substance for use in the manufacture of electrical insulators, &c.—Rockhard Resins, Ltd., 204-206, Great Portland Street, W.1.

Permundum Varnishes (lettering and design). No. 534448. Class 1. Varnishes. Enfield Cable Works, Ltd., 296-302, High Holborn, W.C.1.

Permel. No. 535015. Class 5. Enamelled wire.—British Permel Enamelled Wire, Ltd., Columbia House, Aldwych, W.C.2.

Dajen (lettering and design). No. 531247. All goods in Class 8. No. 531248. Class 13. Electrical fusible cut-outs.—Electro-Thermic Development Co., Ltd., St. Stephen's House, Westminster, S.W.1.

Ekco (lettering and design). No. 534290. Class 8. Radio receiving sets and units for supplying electric power to radio receiving sets from domestic power mains.—E. K. Cole, Ltd., Priory Crescent, Southend-on-Sea.

Goodyear (lettering and design). No. 535824. Class 8. Electric batteries not for medical purposes.—Goodyear Tire & Rubber Co., Akron, O., U.S.A. (British representatives: Mewburn, Ellis & Co., 70-72, Chancery Lane, W.C.2.)

The Work of the N.P.L.

On November 24th, Dr. H. J. Gough, superintendent of the Engineering Department of the National Physical Laboratory, Teddington, delivered a lecture to the Birmingham & District Association of the Institution of Civil Engineers, in which he gave a brief description of the activities of the various departments of the Laboratory, typical examples being mentioned in each case of engineering problems which were receiving attention at the present time, with particulars of the advances made. Electrical standards and instruments, national high-voltage distribution, wireless communication, and directional signalling received attention in the Electricity Department, which was also concerned with the improvement of lighting in factories, coal-mines, streets, and vehicles.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ambleside.—Café, Waterhead Pier, for D. D. Reid (electric lighting installation); H. Jennings, Compston Street.

Aylesham (DOVER).—R.C. schools and institute; priest-in-charge.

Bath.—Hospital extensions (£14,750); borough surveyor.

Bedford.—School, London Road Housing Estate; G. P. Allen, education architect. Houses (100); borough engineer.

Blackburn.—Greyhound racing track, Hill Street, for Bolton Greyhound Racing Co., Ltd. Girls' school; Very Rev. J. Sinker, The Vicarage.

Bolsover (DERBYSHIRE).—Houses, Moorfield Lane Estate; T. B. Kenyon, U.D.C. clerk.

Burnley.—Housing scheme, Worsthorne; R.D.C. surveyor.

Bury St. Edmunds.—Factory, for West Suffolk Canners, Ltd. (£5,650); S. J. M. Sampson, secretary, 58, Abbeygate Street.

Cannock.—Offices, Stafford Road, for National Provincial Bank, Ltd.; F. C. R. Palmer, architects' department, 15, Bishopsgate, E.C.2.

Cranleigh (SURREY).—Houses (50), Snowdenham Hall Estate; A. B. Johnson, New Park.

Crowborough.—Cottage hospital extensions (£5,000); secretary.

Croydon.—Greyhound stadium, Therapia Lane; J. Harrington, 32, Craven Street, W.C.2.

Devonshire.—School, Plympton (£11,525); county architect, Exeter.

Dorchester.—Business stores; International Tea Co., Ltd. (Kearley & Tongue), Mitre Square, London.

Dumfries.—Business stores for Co-operative Society; T. A. Halliday, Leafield Road.

Eccles (LANCS).—Houses (20); borough surveyor.

Exeter.—Stores, 187-191, High Street, for F. W. Woolworth and Co., Ltd.

Gateshead-on-Tyne.—Shops, Wrekenton Road; Mr. Davies, architect, Sheriff Hill. Extensions, High West Street, Methodist Church (£5,000); Brocklehurst & Co., architects, Norfolk Street, Manchester. Alterations, Teams Poor Law Institution (£40,000); F. H. Patterson, borough engineer.

Gillingham.—Houses (22), Lewis Avenue; F. B. Cooper.

Gloucester.—Head post office; H.M. Office of Works, King Charles Street, S.W.1.

Grantham.—Business stores, for Montague Burton, Ltd., Leeds; staff architect.

Guildford.—Houses (156), Stoke Hill Farm Estate; borough engineer. Head post office; H.M. Office of Works, London.

Hebden Bridge (YORKS).—Branch library; U.D.C. surveyor.

Herefordshire.—Conversion of Holme Lacy to mental hospital; Bettington & Son, architects, Hereford.

Hertford.—Cinema, Prison site (£25,000); E. Simmons, architect.

Heywood.—Health offices and clinic with electric lighting installations (£4,700); J. Gott, builder, Pilsworth Road.

High Wycombe.—Business stores, Frogmoor, for Montague Burton, Ltd., Leeds.

Hull.—College, Beverley High Road, for the Marist Society of the Roman Catholics; Williams & Jopling, architects, Ferres Chambers, Whitefriargate.

Irish Free State.—(CARRAROE & ROSMUCK, GALWAY).—Schools, Carraroe & Rosmuck; M. J. Kennedy, county surveyor, Courthouse, Galway. (DUBLIN).—National schools, Cabra; J. J. Robinson & R. C. Keefe, architects, 8, Merrion Square, N.

Keswick.—Omnibus station; Cumberland Motor Services.

Kidderminster.—Bazaar premises, High Street; Marks and Spencer, Ltd., London. Shop and office block, Hill Street, for G. A. Weston, 19, Roden Avenue; H. & H. Bridges, builders, Marlborough Street.

Leeds.—Stadium; city engineer. Telephone exchange, Crossgates; H.M. Office of Works, King Charles Street, S.W.1.

Lewes (SUSSEX).—Cinema, with electrical work, for Cinema Service, Ltd. (£16,000); A. Mather, architect, Leicester Square Chambers, London, W.C.

Lincolnshire.—Extensions, Sleaford Poor Law Institution (£22,000), for Kesteven P.A.C.; and school, Stamford (£11,500), for Kesteven E.C.; clerk, Sleaford.

Litherland (NEAR LIVERPOOL).—Houses (50); U.D.C. surveyor.

Little Lever (LANCS).—Houses (24); U.D.C. surveyor.

Liverpool.—Houses, Knowsley Estate; land steward and surveyor, Municipal Buildings. Extensions, Lourdes Hospital, Paul Street, with electric lighting installation (£5,000); A. Ellis, architect, 24, The Temple, Dale Street. Offices, Drury Lane, for B.T.G. Trust, Ltd.; H. A. Thomas, Britannia Buildings, 46, Fenwick Street.

London.—(CHELSEA).—Premises for International Tea Co., Ltd., King's Road; F. W. Shenton. (DEPTFORD).—Dwellings, with electrical work, Deptford Park Estate (£48,710), for L.C.C. Dog racing track, New Cross (£25,000), for New Cross Greyhounds, Ltd.; Messrs. McAlpine, contractors. Tenements, Evelyn Estate (£43,000); Henry Boot & Sons, Ltd. (FINSBURY).—Tenements, Margaret Street (£52,000); borough engineer. (ST. PANCRAS).—Flats (60), Leighton Road; borough engineer. (SYDENHAM).—All Saints' Church; Rev. G. Branson, vicar. (WOOLWICH).—R.C. Church, Mottingham Lane; F. A. Walters and Son, architects, 28, Great Ormond Street, W.C.

Macclesfield.—Junior elementary school, Moss Farm Estate (electric lighting installation); E. Hamson, borough surveyor, Town Hall.

Manchester.—Cinema, Wythenshawe Estate, Northenden; Thorpe & Collier, architects, 66a, Deansgate. Church for Rev. J. M. Routledge, St. Dunstan's, Blue Stone Road, Moston (£20,000); W. Telford Gunson & Son, architects, 10, Marsden Street. New wing, Royal Infirmary (£70,000); T. Worthington & Sons, architects, 178, Oxford Road. Extensions, Whitworth Street, for the Refuge Assurance Co., Ltd. (£250,000); R. Carlyle Co., Ltd., builder, Old Trafford.

Mansfield.—Houses (37); borough surveyor.

Merrow (SURREY).—Houses (150), near Down Road; R. Holford & Co.

Middlesbrough.—Building for Anglo-American Oil Co.; H. Jackson, Kingston Unity Buildings, Eastgate, Leeds.

Middlesex.—Schools, Cranborne Crescent, South Mimms; director of education, 40, Eccleston Square, London, S.W.

Newcastle-on-Tyne.—Extensions to Novomobiles' Garages, Dinsdale Road; Wright & Anderson, contractors, Coulthards Lane, Gateshead.

Northampton.—Hosiery factory, Grafton Street; J. Leighton, Ltd. Extensions, tannery, Mill Road; Manfield & Sons, Ltd.

Nottinghamshire.—Central Isolation Hospital for Treatment of Infectious Diseases, Edwinstowe, Newark; L. Maggs, county architect, Shire Hall.

Oldham.—School for St. Anne's Church, Longsight, Royton (£8,000); T. L. L. Moore, 3, Raymond Buildings, Gray's Inn, London, W.C.1.

Orpington (KENT).—Methodist church (£11,000); trustees' secretary.

Oswestry (SALOP).—Bazaar stores, Cross Street; F. W. Woolworth & Co., Ltd., London.

Paignton.—Hotel, Horseshoe Road; J. Russell.

Penrith.—Houses (24); U.D.C. surveyor.

Portsmouth.—Ward block, Royal Portsmouth Hospital; secretary.

Rugby.—Café, High Street and Laurence Sheriff Street, for S. B. Robins; Willard, Son & Ellingham, architects, Broughton House, Market Place.

Shaftesbury.—Cinema, Bimport Street, for P. J. Carter, The Palace, Blandford.

Sheffield.—Houses (58), Furnace Lane; J. L. Conway. Houses (68), Thorpe House Estate; W. & J. Laver. Houses (44), Victor Avenue; C. F. Napper.

Slough.—Three factories, Bedford Avenue; Slough Estates, Ltd. Houses (23), Beech Road; W. T. Heath.

Sockets Heath (ESSEX).—Block of business premises, with electrical work and lifts, for J. W. Pigg & Sons; Brown Bros., builders, Grays.

Somerset.—Secondary schools, Weston-super-Mare; director of education, Taunton.

Southgate.—Houses (56), Madiera Road; J. Neilson. Houses (26), off Wades Hill; E. J. Westoby & Son. Factory and offices, Chase Road; Newby Bros.

Southport.—Junior and infants' schools, Birkdale; L. Barnish, architect, 58, Rodney Street, Liverpool.

South Shields.—Two shops, Green Lane West, for Lock Brothers; H. Hill, architect, 10, Winchester Street. Houses (30), Nora Street and Harton Lane, and stores, North Street; F. W. Newby, architect, 37, King Street. Rehousing scheme, Laygate area; J. P. Watson, borough engineer, Town Hall.

Stanley (DURHAM).—Methodist church and school; trustees, South Moor Methodist Church.

Stirlingshire.—Houses (300) for the C.C.; clerk, Stirling. School, Drip Road, Stirling Housing Estate, for County E.C.; clerk.

Stockport.—School, Lisburne Lane, for Borough E.C.; A. Lawton, secretary.

Stretford.—Extensions, mills, Trafford Park, for Messrs. Bovis, Ltd.; F. Fowler, Westminster Bank Chambers, Macclesfield.

Sunderland.—Dog-racing track, Grindon (£20,000); Oliver & Roberts, engineers, 6, Broad Street Place, E.C.2.

Surbiton.—Hospital for Governors; A. C. C. Dunn, hon. secretary.

Sutton Coldfield.—Houses (74), Boldmere Road; Morris, Jacobs & Co., Ltd. Five shops and houses, Birmingham Road; Quinton Estates, Ltd.

Sutton and Cheam.—Houses (72); W. H. Grieves, surveyor.

Thorne (YORKS).—Church, Field Road, Stainsforth; J. B. Richardson, architect, 26, Printing Office Street, Doncaster.

Torquay.—Extensions, 55, Union Street; Freeman, Hardy & Willis, Ltd.

Wakefield.—Houses (80), Darnley Estate; P. Morris, housing architect, Town Hall.

Walsingham.—Houses (22); Fisher & Son, builders.

Warrington.—Development of Ackers Road Estate, Latchford Without (electrical work); Atlas Building & Construction Co., Wilderspool Causeway. Extensions, rolling mills, Bank Quay; British Aluminium Co., Ltd.

Wednesfield.—Houses (26); McKeand, Smith & Co., Ltd., builders, Wednesbury.

West Bromwich.—Sewage disposal works; borough engineer.

Weston-super-Mare.—Alterations, with shopping arcade, High Street, for Podger & Davis, Ltd.; Autton & Moore, builders.

West Riding.—Infants' school, Bingley Cottingley (electric lighting installation); E. Turner, Ltd., builders, Bradford Street, Keighley. Senior school, Royston; Education Officer, County Hall, Wakefield.

West Wickham (KENT).—Post Office and telephone exchange; Commercial Structures, Ltd., builders.

Weymouth.—R.C. church; Rev. Canon J. Ketele, St. Augustine's Church.

Whickham-on-Tyne.—Houses (102), for W. & R. Dodds; G. Adams, architect, King George Avenue, Dunston.

Wimborne.—Houses (32); R.D.C. surveyor.

Wolverhampton.—Head office, South Staffordshire Building Society (£13,359); R. Speake & Son, builders, Stafford Street.

Worthing.—Cinema, Liverpool Gardens (electrical work); Whinney, Son & Austin Hall, architects, 8, Old Jewry, London, E.C. Cinema, Rowlands Road (electrical and heating work), and shops and flats; H. Weston, architect, Finsbury Square, London.